ASHRAE Standard 140-2011

Test Results Comparison
for
Section 5.2 - Building Thermal Envelope and Fabric Load Tests

Results for Autodesk Green Building Studio July 2013
(GBS)
vs.
Informative Annex B8, Section B8.1 Example Results

Prepared By
Autodesk Green Building Studio
(Autodesk)

Results Developed
08-Sep-2013

ASHRAE Standard 140-2011
Computer Programs, Program Authors, and Producers of Example Results for Section 5.2 - Building Thermal Envelope and Fabric Load Tests

The programs used to generate the example results are described in Table B11-1. Under the computer program column, the first entry in each cell is the proper program name and version number. The entries in parentheses are the abbreviations for the programs generally used in the tables and charts which follow.

The second column ("Authoring Organization") indicates the national research facility, university, or industry organization with expertise in building science that wrote the simulation software.

The third column ("Implemented By") indicates the national research facility, university, or industry organization with expertise in building science that performed the simulations. The majority of organizations that performed simulations either ran software written by their organization or otherwise ran other building energy simulation software in addition to that written by their organization.

See Standard 140, Annex B11 for further details.

TABLE B11-1
Computer Programs, Program Authors, and Producers of Example Results

Computer Program (Abbrev.)	Authoring Organization	Example Results Produced by
BLAST-3.0 level 193 v.1 (BLAST-US/IT)	CERL,[a] United States (U.S.)	NREL,[b] U.S. Politecnico Torino, Italy
DOE-2.1D 14 (DOE21D)	LANL/LBNL,[c] U.S.	NREL, U.S.
ESP-RV8 (ESP-DMU)	Strathclyde University, United Kingdom (U.K.)	De Montfort University, U.K.
SERIRES/SUNCODE 5.7 (SRES/SUN)	NREL/Ecotope, U.S.	NREL, U.S.
SERIRES 1.2 (SRES-BRE)	NREL/BRE,[d] U.S./U.K.	BRE, U.K.
S3PAS	University of Sevilla, Spain	University of Sevilla, Spain
TASE	Tampere University, Finland	Tampere University, Finland
TRNSYS 13.1 (TSYS-BEL/BRE)	University of Wisconsin, U.S.	BRE, U.K. Vrije Universiteit (VUB) Brussels, Belgium

[a]CERL-U.S. Army Construction Engineering Research Laboratories
[b]NREL-National Renewable Energy Laboratory
[c]LANL/LBNL-Los Alamos National Laboratory/Lawrence Berkeley National Laboratory
[d]BRE-Building Research Establishment

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Note: The statistics in the tables below are based on the Standard 140 informative example results.
These statistics do not have any substantial importance and are not to be interpreted as acceptance criteria.

Table B8-1. Annual Heating Loads (MWh)

Simulation Model:	ESP	BLAST	DOE21D	SRES-SUN	SRES*	S3PAS	TSYS	TASE	Statistics for Example Results					
Organization or Country:	DMU	US-IT	NREL	NREL	BRE	SPAIN	BEL-BRE	FINLAND	Min	Max	Mean	(Max-Min)/ Mean** (%)	GBS Sep 2013 Autodesk	GBS v3.4 Autodesk
Case														
600 Base Case, South Windows	4.296	4.773	5.709	5.226	5.596	4.882	4.872	5.362	4.296	5.709	5.090	27.8%	4.518	451.7%
610 S. Windows + Overhang	4.355	4.806	5.786	5.280	5.620	4.971	4.970	5.383	4.355	5.786	5.146	27.8%	4.594	459.3%
620 East & West Windows	4.613	5.049	5.944	5.554	5.734	5.564	5.073	5.728	4.613	5.944	5.407	24.6%	5.512	5.504
630 E&W Windows + Overhang & Fins	5.050	5.359	6.469	5.883	6.001	6.095	5.624		5.050	6.469	5.783	24.5%	5.342	5.335
640 Case 600 with Htg Temp. Setback	2.751	2.888	3.543	3.255	3.803	3.065	3.043	3.309	2.751	3.803	3.207	32.8%	2.784	2.781
650 Case 600 with Night Ventilation	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	----		0.000
900 South Windows	1.170	1.610	1.872	1.897	1.988	1.730	1.655	2.041	1.170	2.041	1.745	49.9%	1.654	1.648
910 S. Windows + Overhang	1.575	1.862	2.254	2.174	2.282	2.063	2.097	2.220	1.575	2.282	2.066	34.2%	1.532	1.526
920 East & West Windows	3.313	3.752	4.255	4.093	4.058	4.235	3.776	4.300	3.313	4.300	3.973	24.8%	3.908	3.884
930 E&W Windows + Overhang & Fins	4.143	4.347	5.335	4.755	4.728	5.168	4.740		4.143	5.335	4.745	25.1%	4.320	4.303
940 Case 900 with Htg Temp. Setback	0.793	1.021	1.239	1.231	1.411	1.179	1.080	1.323	0.793	1.411	1.160	53.3%	1.140	1.136
950 Case 900 with Night Ventilation	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	----		0.000
960 Sunspace	2.311	2.664	2.928	2.884	2.851	2.943	3.373	2.816	2.311	3.373	2.846	37.3%	2.594	2.584
195 Solid Conduction	4.167								4.167	4.167	4.167	0.0%	4.625	4.632
200 Surface Convection (Int & Ext IR="off")	5.252								5.252	5.252	5.252	0.0%		
210 Infrared Radiation (Int IR="off", Ext IR="on")	6.456	6.559					6.554	6.967	6.456	6.967	6.634	7.7%		
215 Infrared Radiation (Int IR="on", Ext IR="off")	5.547								5.547	5.547	5.547	0.0%	7.257	726.8%
220 In-Depth Base Case	6.944	7.215	8.787	8.102	8.127	7.422	7.297	7.437	6.944	8.787	7.666	24.0%	8.350	836.5%
230 Infiltration	10.376	10.740	12.243	11.633	11.649	11.037	10.840	10.964	10.376	12.243	11.185	16.7%	11	1092.3%
240 Internal Gains	5.649	6.009	7.448	6.769	6.786	6.194	6.076	6.234	5.649	7.448	6.396	28.1%	7	7.041
250 Exterior Shortwave Absorptance	4.751	5.739	7.024	6.608	6.653	5.974	5.764	5.738	4.751	7.024	6.031	37.7%	6	5.913
270 South Solar Windows	4.510	4.930		5.341	*5.920*		5.047	5.489	4.510	*5.920*	*5.206*	*27.1%*	*5*	*5.006*
280 Cavity Albedo	4.675	5.125		5.937	6.148		5.279	5.841	4.675	6.148	5.501	26.8%	5	5.281
290 South Shading	4.577	4.959		5.406	*5.942*		5.132	5.509	4.577	*5.942*	*5.254*	*26.0%*	*5.652*	*5.646*
300 East/West Window	4.761	5.077		5.587	*5.964*		5.124	5.786	4.761	*5.964*	*5.383*	*22.3%*	*5.831*	*5.826*
310 East/West Shading	5.221	5.327		5.850	*6.165*		5.610		5.221	*6.165*	*5.635*	*16.8%*	*5.793*	*5.787*
320 Thermostat	3.859	4.209		4.627	*5.141*		4.348	4.840	3.859	*5.141*	*4.504*	*28.5%*	*4.231*	*4.230*
395 Low Mass Solid Conduction	4.984	4.799	5.835	5.199	5.201	4.967	4.855	4.839	4.799	5.835	5.085	20.4%	5.773	5.783
400 Low Mass Opaque Windows	6.900	7.075	8.770	7.966	7.973	7.287	7.166	7.326	6.900	8.770	7.558	24.7%	8.319	8.334
410 Low Mass Infiltration	8.596	8.873	10.506	9.726	9.734	9.019	8.936	9.085	8.596	10.506	9.309	20.5%	9	9.268
420 Low Mass Internal Gains	7.298	7.610	9.151	8.365	8.373	7.774	7.697	7.863	7.298	9.151	8.016	23.1%	8	7.923
430 Low Mass Ext. Shortwave Absorptance	5.429	6.488	7.827	7.178	7.186	6.662	6.500	6.510	5.429	7.827	6.723	35.7%	6.381	638.5%
440 Low Mass Cavity Albedo	4.449	4.987		5.652	5.811		5.098	5.642	4.449	5.811	5.273	25.8%	4.801	480.1%
800 High Mass Opaque Windows	4.868	5.953	7.228	6.611	6.600	6.161	5.940	5.861	4.868	7.228	6.153	38.4%	6.328	632.5%
810 High Mass Cavity Albedo	1.839	2.446		3.004	2.828		2.567	2.962	1.839	3.004	2.608	44.7%	2.140	213.0%

* SRES-BRE (SERIRES 1.2) simulations for cases with interior solar absorptance = 0.9 have an input error that likely affects annual heating and cooling loads by <0.2 MWh/y (2-3%); see Section B7.2.

** ABS[(Max-Min) / (Mean of Example Simulation Results)]

ASHRAE Standard 140-2011 Test Results Comparison for Section 5.2 - Building Thermal Envelope and Fabric Load Tests
Autodesk Green Building Studio July 2013 (GBS) vs. Annex B8, Section B8.1 Example Results
By Autodesk Green Building Studio (Autodesk), 08-Sep-2013

Note: The statistics in the tables below are based on the Standard 140 informative example results.
These statistics do not have any substantial importance and are not to be interpreted as acceptance criteria.

Table B8-2. Annual Sensible Cooling Loads (MWh)

Simulation Model:	ESP	BLAST	DOE21D	SRES-SUN	SRES*	S3PAS	TSYS	TASE	Statistics for Example Results					
Organization or Country:	DMU	US-IT	NREL	NREL	BRE	SPAIN	BEL-BRE	FINLAND	Min	Max	Mean	(Max-Min)/	GBS Sep 2013	GBS v3.4
Case												Mean** (%)	Autodesk	Autodesk
600 Base Case, South Windows	6.137	6.433	7.079	7.278	7.964	6.492	6.492	6.778	6.137	7.964	6.832	26.7%	7.611	7.697
610 S. Windows + Overhang	3.915	4.851	4.852	5.448	5.778	4.764	4.601	5.506	3.915	5.778	4.964	37.5%	5.581	5.650
620 East & West Windows	3.417	4.092	4.334	4.633	5.004	4.011	3.901	4.351	3.417	5.004	4.218	37.6%	4.839	4.915
630 E&W Windows + Overhang & Fins	2.129	3.108	2.489	3.493	3.701	2.489	2.416		2.129	3.701	2.832	55.5%	2.902	2.942
640 Case 600 with Htg Temp. Setback	5.952	6.183	6.759	7.026	7.811	6.247	6.246	6.508	5.952	7.811	6.592	28.2%	7.267	7.351
650 Case 600 with Night Ventilation	4.816	5.140	5.795	5.894	6.545	5.088	5.119	5.456	4.816	6.545	5.482	31.5%	5.652	5.726
900 South Windows	2.132	2.600	2.455	3.165	3.415	2.572	2.485	2.599	2.132	3.415	2.678	47.9%	3.166	3.237
910 S. Windows + Overhang	0.821	1.533	0.976	1.872	1.854	1.428	1.326	1.767	0.821	1.872	1.447	72.6%	1.714	1.764
920 East & West Windows	1.840	2.616	2.440	2.943	3.092	2.457	2.418	2.613	1.840	3.092	2.552	49.1%	3.037	3.093
930 E&W Windows + Overhang & Fins	1.039	1.934	1.266	2.173	2.238	1.439	1.416		1.039	2.238	1.644	73.0%	1.752	1.781
940 Case 900 with Htg. Temp. Setback	2.079	2.536	2.340	3.036	3.241	2.489	2.383	2.516	2.079	3.241	2.578	45.1%	3.040	3.108
950 Case 900 with Night Ventilation	0.387	0.526	0.538	0.921	0.589	0.551	0.561	0.771	0.387	0.921	0.605	88.2%	0.724	0.746
960 Sunspace	0.488	0.666	0.428	0.803	0.718	0.643	0.411	0.786	0.411	0.803	0.618	63.4%	0.734	0.752
195 Solid Conduction	0.414								0.414	0.414	0.414	0.0%	0.610	0.621
200 Surface Convection (Int & Ext IR="off")	0.570								0.570	0.570	0.570	0.0%		
210 Infrared Radiation (Int IR="off", Ext IR="on")	0.162	0.613					0.668	0.641	0.162	0.668	0.521	97.1%		
215 Infrared Radiation (Int IR="on", Ext IR="off")	0.639								0.639	0.639	0.639	0.0%	0.637	0.644
220 In-Depth Base Case	0.186	0.701	0.399	0.827	0.835	0.734	0.737	0.683	0.186	0.835	0.638	101.8%	0.377	0.380
230 Infiltration	0.454	0.976	0.692	1.131	1.139	1.020	1.040	0.985	0.454	1.139	0.930	73.7%	0.610	0.613
240 Internal Gains	0.415	1.072	0.660	1.239	1.246	1.108	1.114	1.045	0.415	1.246	0.987	84.2%	0.630	0.636
250 Exterior Shortwave Absorptance	3.213	2.545	2.177	2.924	2.931	2.486	2.684	3.380	2.177	3.380	2.793	43.1%	3.231	3.342
270 South Solar Windows	7.528	8.670		9.828	*10.350*		8.764	8.714	7.528	*10.350*	*8.976*	*31.4%*	9.209	9.287
280 Cavity Albedo	4.873	5.895		6.511	7.114		5.761	6.257	4.873	7.114	6.069	36.9%	6.075	6.130
290 South Shading	5.204	7.011		7.871	*8.089*		6.699	7.431	5.204	*8.089*	*7.051*	*40.9%*	6.709	6.771
300 East/West Window	4.302	5.836		6.665	*7.100*		5.721	5.781	4.302	*7.100*	*5.901*	*47.4%*	5.935	6.020
310 East/West Shading	2.732	4.570		5.245	*5.471*		3.727		2.732	*5.471*	*4.349*	*63.0%*	3.593	3.639
320 Thermostat	5.061	5.906		6.725	*7.304*		5.956	5.663	5.061	*7.304*	*6.103*	*36.8%*	5.912	5.986
395 Low Mass Solid Conduction	0.000	0.011	0.000	0.016	0.014	0.010	0.010	0.011	0.000	0.016	0.009	177.1%		0.000
400 Low Mass Opaque Windows	0.000	0.040	0.002	0.061	0.058	0.042	0.045	0.044	0.000	0.061	0.036	167.3%	0.001	0.001
410 Low Mass Infiltration	0.000	0.059	0.010	0.084	0.084	0.063	0.067	0.065	0.000	0.084	0.054	155.5%	0.004	0.004
420 Low Mass Internal Gains	0.011	0.147	0.051	0.189	0.188	0.154	0.158	0.143	0.011	0.189	0.130	136.9%	0.033	0.034
430 Low Mass Ext. Shortwave Absorptance	0.542	0.617	0.422	0.704	0.684	0.563	0.617	0.875	0.422	0.875	0.628	72.1%	0.928	0.943
440 Low Mass Cavity Albedo	3.967	4.172		4.674	5.204		3.975	4.684	3.967	5.204	4.446	27.8%	4.667	4.729
800 High Mass Opaque Windows	0.113	0.224	0.055	0.272	0.222	0.195	0.207	0.325	0.055	0.325	0.202	133.9%	0.090	0.091
810 High Mass Cavity Albedo	1.052	1.405		1.711	1.708		1.191	1.624	1.052	1.711	1.449	45.5%	1.617	1.656

* SRES-BRE (SERIRES 1.2) simulations for cases with interior solar absorptance = 0.9 have an input error that likely affects annual heating and cooling loads by <0.2 MWh/y (2-3%); see Section B7.2.
Affected results for Cases 270 and 290 through 320 are indicated by italics

** ABS[(Max-Min) / (Mean of Example Simulation Results)]

ASHRAE Standard 140-2011 Test Results Comparison for Section 5.2 - Building Thermal Envelope and Fabric Load Tests
Autodesk Green Building Studio July 2013 (GBS) vs. Annex B8, Section B8.1 Example Results
By Autodesk Green Building Studio (Autodesk), 08-Sep-2013

Note: The statistics in the tables below are based on the Standard 140 informative example results.
These statistics do not have any substantial importance and are not to be interpreted as acceptance criteria.

Table B8-3. Annual Hourly Integrated Peak Heating Loads

Simulation Model:	ESP			BLAST			DOE21D			SRES-SUN			SRES	S3PAS			TSYS			TASE			Example Result Statistics				GBS Sep 2013			GBS v3.4		
Organization or Country:	DMU			US-IT			NREL			NREL				SPAIN			BEL-BRE			FINLAND			Min	Max	Mean	(Max-Min)/	Autodesk			Autodesk		
Case	kW	Date	Hr	kW	Date	Hr	kW	Date	Hr	kW	Date	Hr	##	kW	Date	Hr	kW	Date	Hr	kW	Date	Hr	kW	kW	kW	Mean** (%)	kW	Date	Hr	kW	Date	Hr
600 Base Case, South Windows	3.437	04-Jan	5	3.940	04-Jan	5	4.045	04-Jan	5	4.258	04-Jan	2		4.037	04-Jan	2	3.931	04-Jan	6	4.354	04-Jan	2	3.437	4.354	4.000	22.9%	3.902	04-Jan	5	3.904	04-Jan	5
610 S. Windows + Overhang	3.437	04-Jan	5	3.941	04-Jan	5	4.034	04-Jan	5	4.258	04-Jan	2		4.037	04-Jan	2	3.922	04-Jan	6	4.354	04-Jan	2	3.437	4.354	3.998	22.9%	3.892	04-Jan	5	3.893	04-Jan	5
620 East & West Windows	3.591	04-Jan	6	3.941	04-Jan	5	4.046	04-Jan	5	4.277	04-Jan	2		4.277	04-Jan	2	3.922	04-Jan	6	4.379	04-Jan	2	3.591	4.379	4.062	19.4%	4.168	04-Jan	5	4.170	04-Jan	5
630 E&W Windows + Overhang & Fins	3.592	04-Jan	7	3.941	04-Jan	5	4.025	04-Jan	5	4.280	04-Jan	2		4.278	04-Jan	2	3.922	04-Jan	6				3.592	4.280	4.006	17.2%	3.897	04-Jan	5	3.899	04-Jan	5
640 Case 600 with Htg. Temp. Setback	5.232	04-Jan	7	5.486	04-Jan	8	5.943	04-Jan	8	6.530	04-Jan	8		6.347	04-Jan	8	5.722	04-Jan	8	6.954	04-Jan	8	5.232	6.954	6.031	28.6%	5.673	03-Jan	8	5.678	03-Jan	8
650 Case 600 with Night Ventilation	0.000			0.000	04-Jan		0.000			0.000				0.000			0.000			0.000			0.000	0.000	0.000	----				0.000		
900 South Windows	2.850	04-Jan	7	3.453	04-Jan	7	3.557	04-Jan	7	3.760	04-Jan	7		3.608	04-Jan	8	3.517	04-Jan	7	3.797	04-Jan	7	2.850	3.797	3.506	27.0%	3.613	04-Jan	7	3.616	04-Jan	7
910 S. Windows + Overhang	2.858	04-Jan	7	3.456	04-Jan	7	3.564	04-Jan	7	3.764	04-Jan	7		3.618	04-Jan	8	3.536	04-Jan	7	3.801	04-Jan	7	2.858	3.801	3.514	26.8%	3.497	03-Jan	9	3.511	03-Jan	9
920 East & West Windows	3.308	04-Jan	7	3.703	04-Jan	7	3.805	04-Jan	7	4.013	04-Jan	7		4.029	04-Jan	7	3.708	04-Jan	7	4.061	04-Jan	7	3.308	4.061	3.804	19.8%	3.888	04-Jan	7	3.891	04-Jan	7
930 E&W Windows + Overhang & Fins	3.355	04-Jan	7	3.732	04-Jan	7	3.832	04-Jan	7	4.042	04-Jan	7		4.064	04-Jan	7	3.744	04-Jan	7				3.355	4.064	3.795	18.7%	3.641	03-Jan	9	3.649	03-Jan	9
940 Case 900 with Htg. Temp. Setback	3.980	04-Jan	7	5.028	04-Jan	8	5.665	04-Jan	8	6.116	04-Jan	8		6.117	04-Jan	8	5.122	03-Jan	9	6.428	04-Jan	8	3.980	6.428	5.494	44.6%	5.743	04-Jan	8	5.752	04-Jan	8
950 Case 900 with Night Ventilation	0.000			0.000			0.000			0.000				0.000			0.000			0.000			0.000	0.000	0.000	----				0.000		
960 Sunspace	2.410	04-Jan	7	2.751	04-Jan	8	2.727	04-Jan	8	2.863	04-Jan	8		2.852	04-Jan	8	2.522	04-Jan	8	2.779	04-Jan	8	2.410	2.863	2.701	16.8%	2.405	04-Jan	8	2.617	04-Jan	8
195 Solid Conduction	2.004	04-Jan	2																				2.004	2.004	2.004	0.0%	2.023	04-Jan	8	2.175	04-Jan	7
200 Surface Convection (Int & Ext IR="off")	2.651	04-Jan	5																				2.651	2.651	2.651	0.0%		04-Jan	7			
210 Infrared Radiation (Int IR="off", Ext IR="on")	2.701	04-Jan	5	2.973	04-Jan	5											2.981	04-Jan	5	3.325	04-Jan	2	2.701	3.325	2.995	20.8%		04-Jan	7			
215 Infrared Radiation (Int IR="on", Ext IR="off")	2.787	04-Jan	5																				2.787	2.787	2.787	0.0%	2.970	04-Jan	7	3.181	04-Jan	5
220 In-Depth Base Case	2.867	04-Jan	5	3.280	04-Jan	5	3.465	04-Jan	5	3.695	04-Jan	2		3.348	04-Jan	8	3.336	04-Jan	6	3.520	04-Jan	2	2.867	3.695	3.359	24.7%	3.094	04-Jan	7	3.341	04-Jan	5
230 Infiltration	4.386	04-Jan	5	4.984	04-Jan	2	4.994	04-Jan	2	5.279	04-Jan	2		5.159	04-Jan	2	4.892	04-Jan	6	5.107	04-Jan	2	4.386	5.279	4.972	18.0%	4.609	03-Jan	9	4.719	03-Jan	9
240 Internal Gains	2.685	04-Jan	5	3.100	04-Jan	5	3.282	04-Jan	5	3.495	04-Jan	2		3.159	04-Jan	8	3.153	04-Jan	6	3.333	04-Jan	8	2.685	3.495	3.172	25.5%	2.914	04-Jan	7	3.159	04-Jan	5
250 Exterior Shortwave Absorptance	2.866	04-Jan	5	3.279	04-Jan	5	3.465	04-Jan	5	3.695	04-Jan	2		3.341	04-Jan	6	3.336	04-Jan	6	3.525	04-Jan	2	2.866	3.695	3.358	24.7%	3.329	04-Jan	5	3.332	04-Jan	5
270 South Windows	2.863	04-Jan	5	3.277	04-Jan	5				3.661	04-Jan	2					3.336	04-Jan	6	3.738	04-Jan	2	2.863	3.738	3.375	25.9%	3.317	04-Jan	7	3.317	04-Jan	7
280 Cavity Albedo	2.864	04-Jan	5	3.278	04-Jan	5				3.685	04-Jan	2					3.336	04-Jan	6	3.759	04-Jan	2	2.864	3.759	3.384	26.4%	3.307	04-Jan	7	3.307	04-Jan	7
290 South Shading	2.863	04-Jan	5	3.277	04-Jan	5				3.661	04-Jan	2					3.328	04-Jan	6	3.738	04-Jan	2	2.863	3.738	3.373	25.9%	3.589	04-Jan	7	3.590	04-Jan	7
300 East/West Window	3.014	04-Jan	6	3.276	04-Jan	5				3.681	04-Jan	2					3.328	04-Jan	6	3.770	04-Jan	2	3.014	3.770	3.414	22.1%	3.610	04-Jan	5	3.611	04-Jan	5
310 East/West Shading	3.015	04-Jan	6	3.277	04-Jan	5				3.669	04-Jan	2					3.328	04-Jan	6				3.015	3.669	3.322	19.7%	3.305	04-Jan	5	3.307	04-Jan	5
320 Thermostat	2.861	04-Jan	5	3.275	04-Jan	5				3.651	04-Jan	2					3.336	04-Jan	6	3.735	04-Jan	3	2.861	3.735	3.372	25.9%	3.315	04-Jan	7	3.317	04-Jan	7
395 Low Mass Solid Conduction	2.062	04-Jan	7	2.209	04-Jan	8	2.328	04-Jan	3	2.385	04-Jan	3		2.263	04-Jan	4	2.221	04-Jan	8	2.270	04-Jan	3	2.062	2.385	2.248	14.4%	2.165	04-Jan	9	2.361	04-Jan	4
400 Low Mass Opaque Windows	2.867	04-Jan	5	3.280	04-Jan	5	3.476	04-Jan	5	3.695	04-Jan	2		3.342	04-Jan	8	3.336	04-Jan	6	3.520	04-Jan	2	2.867	3.695	3.359	24.6%	3.094	04-Jan	7	3.351	04-Jan	5
410 Low Mass Infiltration	3.625	04-Jan	5	4.124	04-Jan	5	4.233	04-Jan	5	4.487	04-Jan	2		4.227	04-Jan	2	4.114	04-Jan	6	4.314	04-Jan	2	3.625	4.487	4.161	20.7%	3.654	04-Jan	6	3.843	04-Jan	5
420 Low Mass Internal Gains	3.443	04-Jan	5	3.944	04-Jan	5	4.050	04-Jan	5	4.287	04-Jan	2		4.044	04-Jan	2	3.931	04-Jan	6	4.126	04-Jan	2	3.443	4.287	3.975	21.2%	3.482	04-Jan	6	3.661	04-Jan	5
430 Low Mass Ext. Shortwave Absorptance	3.442	04-Jan	5	3.944	04-Jan	5	4.050	04-Jan	5	4.287	04-Jan	2		4.044	04-Jan	2	3.931	04-Jan	6	4.137	04-Jan	2	3.442	4.287	3.976	21.3%	3.672	04-Jan	7	3.943	04-Jan	5
440 Low Mass Cavity Albedo	3.439	04-Jan	5	3.942	04-Jan	5				4.277	04-Jan	2					3.931	04-Jan	6	4.376	04-Jan	2	3.439	4.376	3.993	23.5%	3.902	04-Jan	5	3.904	04-Jan	5
800 High Mass Opaque Windows	3.227	04-Jan	5	3.793	04-Jan	7	3.909	04-Jan	7	4.138	04-Jan	2		3.902	04-Jan	8	3.786	04-Jan	7	3.939	04-Jan	7	3.227	4.138	3.813	23.9%	3.390	04-Jan	5	3.478	04-Jan	5
810 High Mass Cavity Albedo	2.979	04-Jan	7	3.566	04-Jan	7				3.915	04-Jan	7					3.606	04-Jan	7	3.963	04-Jan	7	2.979	3.963	3.606	27.3%	3.551	03-Jan	9	3.564	03-Jan	9

* SRES-BRE (SERIRES 1.2) simulations did not produce output for this variable.

** ABS[(Max-Min) / (Mean of Example Simulation Results)]

ASHRAE Standard 140-2011 Test Results Comparison for Section 5.2 - Building Thermal Envelope and Fabric Load Tests
Autodesk Green Building Studio July 2013 (GBS) vs. Annex B8, Section B8.1 Example Results
By Autodesk Green Building Studio (Autodesk), 08-Sep-2013

Note: The statistics in the tables below are based on the Standard 140 informative example results.
These statistics do not have any substantial importance and are not to be interpreted as acceptance criteria.

Table B8-4. Annual Hourly Integrated Peak Sensible Cooling Loads

Simulation Model:	ESP			BLAST			DOE21D			SRES-SUN			SRES	S3PAS			TSYS			TASE			Example Result Statistics				GBS Sep 2013			GBS v3.4		
Organization or Country:	DMU			US-IT			NREL			NREL			BRE*	SPAIN			BEL-BRE			FINLAND			Min	Max	Mean	(Max-Min)/	Autodesk			Autodesk		
Case	kW	Date	Hr	kW	Date	Hr	kW	Date	Hr	kW	Date	Hr		kW	Date	Hr	kW	Date	Hr	kW	Date	Hr	kW	kW	kW	Mean** (%)	kW	Date	Hr	kW	Date	Hr
600 Base Case, South Windows	6.194	17-Oct	13	5.965	16-Oct	14	6.656	16-Oct	13	6.827	16-Oct	14		6.286	25-Nov	14	6.486	16-Oct	14	6.812	17-Oct	14	5.965	6.827	6.461	13.3%	6.384	17-Oct	15	6.620	17-Oct	15
610 S. Windows + Overhang	5.669	25-Nov	13	5.824	25-Nov	14	6.064	13-Jan	14	6.371	25-Nov	14		6.170	25-Nov	14	5.675	25-Nov	14	6.146	17-Oct	14	5.669	6.371	5.988	11.7%	5.999	13-Jan	14	6.018	13-Jan	14
620 East & West Windows	3.634	26-Jul	16	4.075	26-Jul	17	4.430	26-Jul	17	4.593	26-Jul	17		4.297	26-Jul	17	4.275	26-Jul	17	5.096	26-Jul	16	3.634	5.096	4.343	33.7%	4.493	26-Jul	18	4.518	26-Jul	18
630 E&W Windows + Overhang & Fins	3.072	26-Jul	16	3.704	26-Jul	17	3.588	26-Jul	17	4.116	26-Jul	17		3.665	26-Jul	17	3.608	26-Jul	17				3.072	4.116	3.626	28.8%	3.592	26-Jul	18	3.610	26-Jul	18
640 Case 600 with Htg. Temp. Setback	6.161	17-Oct	13	5.892	16-Oct	14	6.576	16-Oct	14	6.776	16-Oct	14		6.250	25-Nov	14	6.442	16-Oct	14	6.771	17-Oct	14	5.892	6.776	6.410	13.8%	6.343	17-Oct	15	6.571	17-Oct	15
650 Case 600 with Night Ventilation	6.031	17-Oct	13	5.831	16-Oct	14	6.516	16-Oct	14	6.671	16-Oct	14		6.143	25-Nov	14	6.378	17-Oct	14	6.679	17-Oct	14	5.831	6.679	6.321	13.4%	6.243	17-Oct	15	6.413	17-Oct	15
900 South Windows	2.888	17-Oct	14	3.155	06-Oct	15	3.458	17-Oct	14	3.871	17-Oct	14		3.334	17-Oct	15	3.567	17-Oct	15	3.457	17-Oct	15	2.888	3.871	3.390	29.0%	3.613	17-Oct	16	3.650	17-Oct	16
910 S. Windows + Overhang	1.896	17-Oct	15	2.500	21-Oct	15	2.336	17-Oct	15	3.277	17-Oct	15		2.786	17-Oct	15	2.792	17-Oct	15	3.147	17-Oct	15	1.896	3.277	2.676	51.6%	2.583	17-Oct	16	2.911	17-Oct	16
920 East & West Windows	2.385	26-Jul	16	2.933	26-Jul	17	3.109	26-Jul	17	3.487	26-Jul	17		3.071	26-Jul	17	3.050	26-Jul	17	3.505	26-Jul	17	2.385	3.505	3.077	36.4%	3.331	26-Jul	18	3.359	26-Jul	18
930 E&W Windows + Overhang & Fins	1.873	26-Jul	17	2.546	26-Jul	17	2.388	26-Jul	18	3.080	26-Jul	17		2.486	26-Jul	17	2.498	26-Jul	17				1.873	3.080	2.479	48.7%	2.528	26-Jul	18	2.550	26-Jul	18
940 Case 900 with Htg. Temp. Setback	2.888	17-Oct	14	3.155	06-Oct	15	3.458	17-Oct	14	3.871	17-Oct	14		3.334	17-Oct	15	3.567	17-Oct	15	3.457	17-Oct	15	2.888	3.871	3.390	29.0%	3.620	17-Oct	16	3.657	17-Oct	16
950 Case 900 with Night Ventilation	2.033	02-Sep	14	2.621	02-Sep	15	2.664	02-Sep	15	3.170	02-Sep	14		2.677	02-Sep	15	2.686	02-Sep	15	2.867	02-Sep	14	2.033	3.170	2.674	42.5%	3.072	02-Sep	16	3.103	#####	16
960 Sunspace	0.953	16-Aug	16	1.144	26-Jul	16	1.057	26-Jul	16	1.370	26-Jul	16		1.179	26-Jul	16	1.378	26-Jul	16	1.403	26-Jul	16	0.953	1.403	1.212	37.1%	1.302	26-Jul	17	1.318	26-Jul	17
195 Solid Conduction	0.651	26-Jul	15																				0.651	0.651	0.651	0.0%	0.720	26-Jul	19	0.807	26-Jul	18
200 Surface Convection (Int & Ext IR="off")	0.863	16-Aug	14																				0.863	0.863	0.863	0.0%		26-Jul	18			
210 Infrared Radiation (Int IR="off", Ext IR="on")	0.476	16-Aug	16	1.017	26-Jul	15											1.068	26-Jul	16	1.142	26-Jul	15	0.476	1.142	0.926	71.9%		26-Jul	17			
215 Infrared Radiation (Int IR="on", Ext IR="off")	1.007	11-Aug	14																				1.007	1.007	1.007	0.0%	0.987	26-Jul	18	1.109	26-Jul	17
220 In-Depth Base Case	0.560	27-Jul	15	1.166	26-Jul	15	0.937	27-Jul	14	1.340	26-Jul	15		1.215	26-Jul	16	1.179	26-Jul	16	1.213	26-Jul	15	0.560	1.340	1.087	71.7%	0.877	26-Jul	17	0.882	26-Jul	17
230 Infiltration	1.059	27-Jul	15	1.646	26-Jul	15	1.455	27-Jul	14	1.875	26-Jul	15		1.700	26-Jul	15	1.708	26-Jul	16	1.749	26-Jul	15	1.059	1.875	1.599	51.0%	1.624	16-Aug	18	1.633	#####	18
240 Internal Gains	0.739	27-Jul	15	1.347	26-Jul	15	1.119	27-Jul	14	1.540	26-Jul	15		1.398	26-Jul	16	1.361	26-Jul	16	1.397	26-Jul	15	0.739	1.540	1.272	63.0%	0.946	26-Jul	18	1.059	26-Jul	17
250 Exterior Shortwave Absorptance	3.360	05-Sep	12	3.036	05-Sep	12	2.605	05-Sep	11	2.590	26-Aug	14		2.258	26-Aug	14	3.228	05-Sep	13	4.912	05-Sep	12	2.258	4.912	3.141	84.5%	2.173	26-Aug	16	2.376	#####	16
270 South Windows	6.356	25-Nov	13	6.641	25-Nov	14				7.234	16-Oct	14					6.764	17-Oct	14	6.867	16-Oct	14	6.356	7.234	6.772	13.0%	6.598	17-Oct	15	6.631	17-Oct	15
280 Cavity Albedo	4.444	17-Oct	13	4.631	25-Nov	13				5.220	16-Oct	14					4.786	16-Oct	14	5.236	16-Oct	14	4.444	5.236	4.863	16.3%	4.716	16-Oct	15	4.740	16-Oct	15
290 South Shading	6.269	13-Jan	13	6.555	25-Nov	14				6.976	25-Nov	14					6.203	25-Nov	14	6.621	25-Nov	14	6.203	6.976	6.525	11.9%	6.376	13-Jan	14	6.390	13-Jan	14
300 East/West Window	3.404	26-Jul	16	4.093	26-Jul	17				4.657	26-Jul	17					4.278	26-Jul	17	4.929	26-Jul	17	3.404	4.929	4.272	35.7%	4.002	26-Jul	18	4.295	26-Jul	18
310 East/West Shading	2.848	26-Jul	16	3.749	30-Jun	17				4.164	26-Jul	17					3.589	26-Jul	17				2.848	4.164	3.587	36.7%	3.114	26-Jul	19	3.361	26-Jul	18
320 Thermostat	5.701	25-Nov	13	5.946	25-Nov	14				6.553	16-Oct	14					6.178	17-Oct	14	6.141	16-Oct	14	5.701	6.553	6.104	14.0%	5.457	17-Oct	15	5.759	17-Oct	15
395 Low Mass Solid Conduction	0.000			0.362	26-Jul	18	0.000			0.394	26-Jul	17		0.356	26-Jul	18	0.363	26-Jul	18	0.345	26-Jul	18	0.000	0.394	0.260	151.6%				0.000		
400 Low Mass Opaque Windows	0.000			0.581	26-Jul	17	0.265	27-Jul	17	0.666	26-Jul	16		0.612	26-Jul	17	0.613	26-Jul	17	0.572	26-Jul	17	0.000	0.666	0.473	140.9%	0.190	26-Jul	19	0.193	26-Jul	19
410 Low Mass Infiltration	0.035	27-Jul	16	0.699	26-Jul	17	0.413	27-Jul	17	0.814	26-Jul	15		0.724	26-Jul	16	0.743	26-Jul	17	0.710	26-Jul	17	0.035	0.814	0.591	131.8%	0.315	27-Jul	18	0.317	27-Jul	18
420 Low Mass Internal Gains	0.258	27-Jul	15	0.923	26-Jul	15	0.631	27-Jul	15	1.047	26-Jul	15		0.938	26-Jul	15	0.938	26-Jul	16	0.921	26-Jul	15	0.258	1.047	0.808	97.7%	0.610	16-Aug	18	0.614	#####	18
430 Low Mass Ext. Shortwave Absorptance	1.493	16-Aug	14	1.772	26-Aug	14	1.427	16-Aug	14	1.762	26-Jul	15		1.575	26-Jul	15	1.798	05-Sep	13	2.578	05-Sep	12	1.427	2.578	1.772	64.9%	1.968	15-Aug	15	2.056	#####	15
440 Low Mass Cavity Albedo	4.546	17-Oct	13	4.424	16-Oct	14				5.053	16-Oct	14					4.686	16-Oct	14	5.278	17-Oct	14	4.424	5.278	4.797	17.8%	4.557	17-Oct	15	4.816	17-Oct	15
800 High Mass Opaque Windows	0.585	27-Jul	14	0.967	16-Aug	14	0.743	28-Jul	14	1.352	27-Jul	14		1.028	27-Jul	15	0.983	16-Aug	14	1.358	05-Sep	12	0.585	1.358	1.002	77.1%	0.739	28-Jul	16	0.745	28-Jul	16
810 High Mass Cavity Albedo	1.852	02-Sep	14	2.357	26-Aug	14				2.991	02-Sep	14					2.344	02-Sep	14	2.862	02-Sep	14	1.852	2.991	2.481	45.9%	2.509	02-Sep	16	2.534	#####	16

* SRES-BRE (SERIRES 1.2) simulations did not produce output for this variable.

** ABS[(Max-Min) / (Mean of Example Simulation Results)]

ASHRAE Standard 140-2011 Test Results Comparison for Section 5.2 - Building Thermal Envelope and Fabric Load Tests
Autodesk Green Building Studio July 2013 (GBS) vs. Annex B8, Section B8.1 Example Results
By Autodesk Green Building Studio (Autodesk), 08-Sep-2013

Note: The statistics in the tables below are based on the Standard 140 informative example results.
These statistics do not have any substantial importance and are not to be interpreted as acceptance criteria.

Table B8-5. Free-Float Temperature Output

MAXIMUM ANNUAL HOURLY INTEGRATED ZONE TEMPERATURE

Simulation Model:	ESP	BLAST	DOE21D	SRES-SUN	SRES	S3PAS	TSYS	TASE	Example Result Statistics				GBS Sep 2013	GBS v3.4
Organization or Country:	DMU	US-IT	NREL	NREL	BRE*	SPAIN	BEL-BRE	FINLAND	Min	Max	Mean	(Max-Min)/	Autodesk	Autodesk
Case	T (°C) Date Hr	T (°C) Date Hr	T (°C) Date Hr	T (°C) Date Hr		T (°C) Date Hr	T (°C) Date Hr	T (°C) Date Hr	T (°C)	T (°C)	T (°C)	Mean** (%)	T (°C) Date Hr	T (°C) Date Hr
600FF - Low Mass with S. Windows	64.9 17-Oct 15	65.1 16-Oct 15	69.5 17-Oct 15	68.6 16-Oct 15		64.9 16-Oct 16	65.3 17-Oct 16	65.3 15-Oct 16	64.9	69.5	66.2	6.9%	66.8	67.1 17-Oct 16
900FF - High Mass with S. Windows	41.8 17-Oct 15	43.4 02-Sep 16	42.7 02-Sep 15	44.8 02-Sep 15		43.0 02-Sep 15	42.5 17-Oct 15	43.2 15-Sep 15	41.8	44.8	43.1	6.9%	44.6	44.8 ##### 15
650FF Case 600FF with Night Ventilation	63.2 17-Oct 15	63.5 16-Oct 15	68.2 17-Oct 15	67.0 16-Oct 15		63.3 16-Oct 16	63.7 17-Oct 16	63.8 16-Oct 16	63.2	68.2	64.7	7.7%	63.8	64.1 17-Oct 16
950FF Case 900FF with Night Ventilation	35.5 02-Sep 16	36.2 02-Sep 16	35.9 02-Sep 16	38.5 02-Sep 15		36.1 02-Sep 16	35.7 02-Sep 15	37.6 15-Sep 16	35.5	38.5	36.5	8.1%	37.1	37.1 ##### 16
960 Sunspace	48.9 17-Oct 15	48.9 06-Oct 15	49.0 17-Oct 15	51.0 17-Oct 15		50.2 17-Oct 15	55.3 17-Oct 15	48.9 15-Oct 15	48.9	55.3	50.3	12.8%	50.2	50.4 17-Oct 15

MINIMUM ANNUAL HOURLY INTEGRATED ZONE TEMPERATURE

Simulation Model:	ESP	BLAST	DOE21D	SRES-SUN	SRES	S3PAS	TSYS	TASE	Example Result Statistics				GBS Sep 2013	GBS v3.4
Organization or Country:	DMU	US-IT	NREL	NREL	BRE*	SPAIN	BEL-BRE	FINLAND	Min	Max	Mean	(Max-Min)/	Autodesk	Autodesk
Case	T (°C) Date Hr	T (°C) Date Hr	T (°C) Date Hr	T (°C) Date Hr		T (°C) Date Hr	T (°C) Date Hr	T (°C) Date Hr	T (°C)	T (°C)	T (°C)	Mean** (%)	T (°C) Date Hr	T (°C) Date Hr
600FF - Low Mass with S. Windows	-15.6 04-Jan 7	-17.1 04-Jan 8	-18.8 04-Jan 8	-18.0 04-Jan 7		-17.8 04-Jan 8	-17.8 04-Jan 7	-18.5 08-Jan 9	-18.8	-15.6	-17.6	18.3%	-16.1	-16.1 03-Jan 8
900FF - High Mass with S. Windows	-1.6 04-Jan 8	-3.2 04-Jan 8	-4.3 04-Jan 8	-4.5 04-Jan 8		-4.0 04-Jan 8	-6.4 04-Jan 8	-5.6 08-Jan 9	-6.4	-1.6	-4.2	111.9%	-1.9	-1.9 04-Jan 8
650FF Case 600FF with Night Ventilation	-22.6 04-Jan 6	-23.0 04-Jan 7	-21.6 04-Jan 2	-23.0 04-Jan 2		-22.9 04-Jan 2	-22.8 04-Jan 7	-22.9 02-Jan 23	-23.0	-21.6	-22.7	6.2%	-17.4	-17.3 04-Jan 8
950FF Case 900FF with Night Ventilation	-19.5 04-Jan 6	-20.0 04-Jan 7	-18.6 04-Jan 7	-19.7 04-Jan 7		-20.2 04-Jan 7	-19.3 04-Jan 7	-20.0 07-Jan 22	-20.2	-18.6	-19.6	8.2%	-14.5	-14.5 04-Jan 7
960 Sunspace	2.7 06-Feb 6	1.6 06-Feb 7	3.9 06-Feb 7	3.1 06-Feb 7		1.4 06-Feb 6	-2.8 04-Jan 8	-0.4 05-Feb 7	-2.8	3.9	1.4	492.6%	5.8	5.8 06-Feb 7

AVERAGE ANNUAL HOURLY INTEGRATED ZONE TEMPERATURE

Simulation Model:	ESP	BLAST	DOE21D	SRES-SUN	SRES	S3PAS	TSYS	TASE	Example Result Statistics				GBS Sep 2013	GBS v3.4
Organization or Country:	DMU	US-IT	NREL	NREL	BRE	SPAIN	BEL-BRE	FINLAND	Min	Max	Mean	(Max-Min)/	Autodesk	Autodesk
Case	T (°C)	T (°C)	T (°C)	T (°C)	T (°C)	T (°C)	T (°C)	T (°C)	T (°C)	T (°C)	T (°C)	Mean** (%)	T (°C)	T (°C)
600FF - Low Mass with S. Windows	25.1	25.4	24.6	25.5	25.9	25.2	24.5	24.2	24.2	25.9	25.1	6.8%	27.0	27.1
900FF - High Mass with S. Windows	25.5	25.9	24.7	25.5	25.7	25.2	24.5	24.5	24.5	25.9	25.2	5.9%	27.0	27.1
650FF Case 600FF with Night Ventilation	18.2	18.7	19.1	19.0	19.6	18.4	18.0	18.4	18.0	19.6	18.7	8.7%	19.8	19.9
950FF Case 900FF with Night Ventilation	14.1	14.3	14.3	15.0	14.3	14.0	14.5	14.6	14.0	15.0	14.4	6.7%	15.9	15.9
960 Sunspace	27.5	27.7	28.0	28.7	28.5	28.0	29.0	26.4	26.4	29.0	28.0	9.0%	29.6	29.7

* SRES-BRE (SERIRES 1.2) simulations did not produce output for this variable.

** ABS[(Max-Min) / (Mean of Example Simulation Results)]

ASHRAE Standard 140-2011 Test Results Comparison for Section 5.2 - Building Thermal Envelope and Fabric Load Tests
Autodesk Green Building Studio July 2013 (GBS) vs. Annex B8, Section B8.1 Example Results
By Autodesk Green Building Studio (Autodesk), 08-Sep-2013

Note: The statistics in the tables below are based on the Standard 140 informative example results.
These statistics do not have any substantial importance and are not to be interpreted as acceptance criteria.

Table B8-6. Low Mass Basic Sensitivity Tests

ANNUAL HEATING [MWh]									Statistics for Example Results					
Case	ESP DMU	BLAST US-IT	DOE21D NREL	SRES-SUN NREL	SRES BRE	S3PAS SPAIN	TSYS BEL-BRE	TASE FINLAND	Min	Max	Mean	(Max-Min)/ Mean** (%)	GBS Sep 2013 Autodesk	GBS v3.4 Autodesk
610-600 Heat, S. Shade	0.059	0.033	0.077	0.054	0.024	0.089	0.098	0.021	0.021	0.098	0.057	135.4%	0.076	0.075
620-600 Heat, E&W Orient.	0.317	0.276	0.235	0.328	0.138	0.682	0.201	0.366	0.138	0.682	0.318	171.1%	0.994	0.987
630-620 Heat, E&W Shade	0.437	0.310	0.525	0.329	0.267	0.531	0.551		0.267	0.551	0.421	67.4%	-0.170	-0.169
640-600 Heat, Htg. Setback	-1.545	-1.885	-2.166	-1.971	-1.793	-1.817	-1.829	-2.053	-2.166	-1.545	-1.882	33.0%	-1.734	-1.736
ANNUAL SENSIBLE COOLING [MWh]									Statistics for Example Results					
Case	ESP DMU	BLAST US-IT	DOE21D NREL	SRES-SUN NREL	SRES BRE	S3PAS SPAIN	TSYS BEL-BRE	TASE FINLAND	Min	Max	Mean	(Max-Min)/ Mean** (%)	GBS Sep 2013 Autodesk	GBS v3.4 Autodesk
610-600 Cool, S. Shade	-2.222	-1.582	-2.227	-1.830	-2.186	-1.728	-1.891	-1.272	-2.227	-1.272	-1.867	51.1%	-2.030	-2.048
620-600 Cool, E&W Orient.	-2.720	-2.341	-2.745	-2.645	-2.960	-2.481	-2.591	-2.427	-2.960	-2.341	-2.614	23.7%	-2.772	-2.782
630-620 Cool, E&W Shade	-1.288	-0.984	-1.845	-1.140	-1.303	-1.522	-1.485		-1.845	-0.984	-1.367	63.0%	-1.937	-1.973
640-600 Cool, Htg. Setback	-0.185	-0.250	-0.320	-0.252	-0.153	-0.245	-0.246	-0.270	-0.320	-0.153	-0.240	69.5%	-0.344	-0.346
650-600 Cool, Night Vent	-1.321	-1.293	-1.284	-1.384	-1.419	-1.404	-1.373	-1.322	-1.419	-1.284	-1.350	10.0%	-1.959	-1.971
PEAK HEATING [kW]									Statistics for Example Results					
Case	ESP DMU	BLAST US-IT	DOE21D NREL	SRES-SUN NREL	SRES BRE*	S3PAS SPAIN	TSYS BEL-BRE	TASE FINLAND	Min	Max	Mean	(Max-Min)/ Mean** (%)	GBS Sep 2013 Autodesk	GBS v3.4 Autodesk
610-600 Heat, S. Shade	0.000	0.001	-0.011	0.000		0.000	-0.008	0.000	-0.011	0.001	-0.003	458.2%	-0.010	-0.011
620-600 Heat, E&W Orient.	0.154	0.001	0.001	0.019		0.240	-0.008	0.025	-0.008	0.240	0.062	402.7%	0.266	0.266
630-620 Heat, E&W Shade	0.001	0.000	-0.021	0.003		0.001	0.000		-0.021	0.003	-0.003	900.0%	-0.271	-0.271
640-600 Heat, Htg. Setback	1.795	1.546	1.898	2.272		2.310	1.792	2.600	1.546	2.600	2.030	51.9%	2	1.774
PEAK SENSIBLE COOLING [kW]									Statistics for Example Results					
Case	ESP DMU	BLAST US-IT	DOE21D NREL	SRES-SUN NREL	SRES BRE*	S3PAS SPAIN	TSYS BEL-BRE	TASE FINLAND	Min	Max	Mean	(Max-Min)/ Mean** (%)	GBS Sep 2013 Autodesk	GBS v3.4 Autodesk
610-600 Cool, S. Shade	-0.525	-0.141	-0.592	-0.456		-0.116	-0.811	-0.666	-0.811	-0.116	-0.472	147.1%	0	-0.602
620-600 Cool, E&W Orient.	-2.560	-1.890	-2.226	-2.234		-1.989	-2.211	-1.716	-2.560	-1.716	-2.118	39.8%	-1.891	-1.500
630-620 Cool, E&W Shade	-0.562	-0.371	-0.842	-0.477		-0.632	-0.667		-0.842	-0.371	-0.592	79.6%	-0.901	-0.908
640-600 Cool, Htg. Setback	-0.033	-0.073	-0.080	-0.051		-0.036	-0.044	-0.041	-0.080	-0.033	-0.051	91.8%	-0.041	-0.049
650-600 Cool, Night Vent	-0.163	-0.134	-0.140	-0.156		-0.143	-0.108	-0.133	-0.163	-0.108	-0.140	39.2%	-0.141	-0.207

* SRES-BRE (SERIRES 1.2) simulations did not produce output for this variable.
** ABS[(Max-Min) / (Mean of Example Simulation Results)]

Table B8-7. High Mass Basic Sensitivity Tests

ANNUAL HEATING [MWh]									Statistics for Example Results					
CASES	ESP DMU	BLAST US-IT	DOE21D NREL	SRES-SUN NREL	SRES BRE	S3PAS SPAIN	TSYS BEL-BRE	TASE FINLAND	Min	Max	Mean	(Max-Min)/ Mean** (%)	GBS Sep 2013 Autodesk	GBS v3.4 Autodesk
900-600 Mass, Heat	-3.126	-3.163	-3.837	-3.329	-3.608	-3.152	-3.217	-3.321	-3.837	-3.126	-3.344	21.3%	-2.864	-2.869
910-900 Heat, S. Shade	0.405	0.252	0.382	0.277	0.294	0.333	0.442	0.179	0.179	0.442	0.321	82.1%	-0.122	-0.122
920-900 Heat, E&W Orient.	2.143	2.142	2.383	2.196	2.070	2.505	2.121	2.259	2.070	2.505	2.227	19.5%	2.254	2.236
930-920 Heat, E&W Shade	0.830	0.595	1.080	0.662	0.670	0.933	0.964		0.595	1.080	0.819	59.2%	0.412	0.420
940-900 Heat, Htg. Setback	-0.377	-0.589	-0.633	-0.666	-0.577	-0.551	-0.575	-0.718	-0.718	-0.377	-0.586	58.2%	-0.514	-0.512
960-900 Heat, Sunspace	1.141	1.054	1.056	0.987	0.863	1.213	1.718	0.775	0.775	1.718	1.101	85.7%	0.940	0.936
ANNUAL SENSIBLE COOLING [MWh]									Statistics for Example Results					
CASES	ESP DMU	BLAST US-IT	DOE21D NREL	SRES-SUN NREL	SRES BRE	S3PAS SPAIN	TSYS BEL-BRE	TASE FINLAND	Min	Max	Mean	(Max-Min)/ Mean** (%)	GBS Sep 2013 Autodesk	GBS v3.4 Autodesk
900-600 Mass, Cool	-4.005	-3.833	-4.624	-4.113	-4.549	-3.920	-4.007	-4.179	-4.624	-3.833	-4.154	19.0%	-4.445	-4.461
910-900 Cool, S. Shade	-1.311	-1.067	-1.479	-1.293	-1.561	-1.144	-1.159	-0.832	-1.561	-0.832	-1.231	59.2%	-1.452	-1.472
920-900 Cool, E&W Orient.	-0.292	0.016	-0.015	-0.222	-0.323	-0.115	-0.067	0.014	-0.323	0.016	-0.126	270.1%	-0.129	-0.143
930-920 Cool, E&W Shade	-0.801	-0.682	-1.174	-0.770	-0.854	-1.018	-1.002		-1.174	-0.682	-0.900	54.7%	-1.285	
940-900 Cool, Htg. Setback	-0.053	-0.064	-0.115	-0.129	-0.174	-0.083	-0.102	-0.083	-0.174	-0.053	-0.100	120.5%	-0.126	-0.128
950-900 Cool, Night Vent	-1.745	-2.074	-1.917	-2.244	-2.826	-2.021	-1.924	-1.828	-2.826	-1.745	-2.072	52.2%	-2.442	-2.491
960-900 Cool, Sunspace	-1.644	-1.934	-2.027	-2.362	-2.697	-1.929	-2.074	-1.813	-2.697	-1.644	-2.060	51.1%	-2.432	-2.485
PEAK HEATING [kW]									Statistics for Example Results					
CASES	ESP DMU	BLAST US-IT	DOE21D NREL	SRES-SUN NREL	SRES BRE*	S3PAS SPAIN	TSYS BEL-BRE	TASE FINLAND	Min	Max	Mean	(Max-Min)/ Mean** (%)	GBS Sep 2013 Autodesk	GBS v3.4 Autodesk
900-600 Mass, Heat	-0.587	-0.487	-0.488	-0.498		-0.429	-0.414	-0.557	-0.587	-0.414	-0.494	35.0%	-0.289	-0.288
910-900 Heat, S. Shade	0.008	0.003	0.007	0.004		0.010	0.019	0.004	0.003	0.019	0.008	207.6%	-0.116	-0.105
920-900 Heat, E&W Orient.	0.458	0.250	0.248	0.253		0.421	0.192	0.264	0.192	0.458	0.298	89.4%	0.275	0.275
930-920 Heat, E&W Shade	0.047	0.029	0.027	0.029		0.035	0.036		0.027	0.047	0.034	59.1%	-0.247	-0.242
940-900 Heat, Htg. Setback	1.130	1.575	2.108	2.356		2.509	1.606	2.631	1.130	2.631	1.988	75.5%	2.130	2.136
960-900 Heat, Sunspace	-0.440	-0.702	-0.830	-0.897		-0.756	-0.995	-1.018	-1.018	-0.440	-0.805	71.8%	-1.208	
PEAK SENSIBLE COOLING [kW]									Statistics for Example Results					
CASES	ESP DMU	BLAST US-IT	DOE21D NREL	SRES-SUN NREL	SRES BRE*	S3PAS SPAIN	TSYS BEL-BRE	TASE FINLAND	Min	Max	Mean	(Max-Min)/ Mean** (%)	GBS Sep 2013 Autodesk	GBS v3.4 Autodesk
900-600 Mass, Cool	-3.306	-2.810	-3.198	-2.956		-2.952	-2.919	-3.355	-3.355	-2.810	-3.071	17.7%	-2.771	-2.970
910-900 Cool, S. Shade	-0.992	-0.655	-1.122	-0.594		-0.548	-0.775	-0.310	-1.122	-0.310	-0.714	113.8%	-1.030	-0.739
920-900 Cool, E&W Orient.	-0.503	-0.222	-0.349	-0.384		-0.263	-0.517	0.048	-0.517	0.048	-0.313	180.5%	-0.282	-0.291
930-920 Cool, E&W Shade	-0.512	-0.387	-0.721	-0.407		-0.585	-0.552		-0.721	-0.387	-0.527	63.3%	-0.803	-0.809
940-900 Cool, Htg. Setback	0.000	0.000	0.000	0.000		0.000	0.000	0.000	0.000	0.000	0.000	-----	0.007	0.007
950-900 Cool, Night Vent	-0.855	-0.534	-0.794	-0.701		-0.657	-0.881	-0.590	-0.881	-0.534	-0.716	48.4%	-0.541	-0.547
960-900 Cool, Sunspace	-1.935	-2.011	-2.401	-2.501		-2.155	-2.189	-2.054	-2.501	-1.935	-2.178	26.0%	-2.311	-2.332

* SRES-BRE (SERIRES 1.2) simulations did not produce output for this variable.
** ABS[(Max-Min) / (Mean of Example Simulation Results)]

ASHRAE Standard 140-2011 Test Results Comparison for Section 5.2 - Building Thermal Envelope and Fabric Load Tests
Autodesk Green Building Studio July 2013 (GBS) vs. Annex B8, Section B8.1 Example Results
By Autodesk Green Building Studio (Autodesk), 08-Sep-2013

Note: The statistics in the tables below are based on the Standard 140 informative example results.
These statistics do not have any substantial importance and are not to be interpreted as acceptance criteria.

Table B8-8. Low Mass In-Depth (Cases 195 thru 320) Sensitivity Tests

ANNUAL HEATING [MWh]									Statistics for Example Results					
CASES	ESP DMU	BLAST US-IT	DOE21D NREL	SRES-SUN NREL	SRES* BRE	S3PAS SPAIN	TSYS BEL-BRE	TASE FINLAND	Min	Max	Mean	(Max-Min)/ Mean** (%)	GBS Sep 2013 Autodesk	GBS v3.4 Autodesk
200-195 Surface Convection	1.085								1.085	1.085	1.085	0.0%		
210-200 Ext IR (Int IR "off")	1.204								1.204	1.204	1.204	0.0%		
220-215 Ext IR (Int IR "on")	1.397								1.397	1.397	1.397	0.0%	1.093	1.097
215-200 Int IR (Ext IR "off")	0.295								0.295	0.295	0.295	0.0%		
220-210 Int IR (Ext IR "on")	0.488	0.656					0.743	0.470	0.470	0.743	0.589	46.3%		
230-220 Infiltration	3.432	3.525	3.456	3.531	3.522	3.615	3.543	3.527	3.432	3.615	3.519	5.2%	2.566	2.558
240-220 Internal Gains	-1.295	-1.206	-1.339	-1.333	-1.341	-1.228	-1.221	-1.203	-1.341	-1.203	-1.271	10.9%	-1.323	-1.324
250-220 Ext Solar Abs.	-2.193	-1.476	-1.763	-1.494	-1.474	-1.448	-1.533	-1.699	-2.193	-1.448	-1.635	45.6%	-2.452	-2.452
270-220 South Windows	-2.434	-2.285		-2.761	*-2.207*		-2.250	-1.948	-2.761	-1.948	*-2.314*	*35.1%*	*-3.340*	*-3.359*
280-270 Cavity Albedo	0.165	0.195		0.596	*0.228*		0.232	0.352	0.165	0.596	*0.295*	*146.3%*	*0.275*	*0.275*
320-270 Thermostat	-0.651	-0.721		-0.714	*-0.779*		-0.699	-0.649	*-0.779*	-0.649	*-0.702*	*18.5%*	*-0.779*	*-0.777*
290-270 South Shading	0.067	0.029		0.065	*0.022*		0.085	0.020	0.020	0.085	*0.048*	*135.4%*	*0.642*	*0.640*
300-270 E&W Windows	0.251	0.147		0.246	*0.044*		0.077	0.297	*0.044*	0.297	*0.177*	*142.9%*	*0.821*	*0.820*
310-300 E&W Shading	0.460	0.250		0.263	*0.201*		0.486		*0.201*	0.486	*0.332*	*85.8%*	*-0.038*	*-0.039*
ANNUAL SENSIBLE COOLING [MWh]														
CASES	ESP DMU	BLAST US-IT	DOE21D NREL	SRES-SUN NREL	SRES* BRE	S3PAS SPAIN	TSYS BEL-BRE	TASE FINLAND	Min	Max	Mean	(Max-Min)/ Mean** (%)	GBS Sep 2013 Autodesk	GBS v3.4 Autodesk
200-195 Surface Convection	0.156								0.156	0.156	0.156	0.0%		
210-200 Ext IR (Int IR "off")	-0.408								-0.408	-0.408	-0.408	0.0%		
220-215 Ext IR (Int IR "on")	-0.453								-0.453	-0.453	-0.453	0.0%	0	-0.263
215-200 Int IR (Ext IR "off")	0.069								0.069	0.069	0.069	0.0%		
220-210 Int IR (Ext IR "on")	0.024	0.088					0.069	0.042	0.024	0.088	0.056	114.8%		
230-220 Infiltration	0.268	0.275	0.293	0.304	0.304	0.286	0.303	0.302	0.268	0.304	0.292	12.3%	0	0.233
240-220 Internal Gains	0.229	0.371	0.261	0.412	0.411	0.374	0.377	0.362	0.229	0.412	0.350	52.3%	0.253	0.255
250-220 Ext Solar Abs.	3.027	1.844	1.778	2.097	2.096	1.752	1.947	2.697	1.752	3.027	2.155	59.2%	2.854	2.962
270-220 South Windows	7.342	7.969		9.001	*9.515*		8.027	8.031	7.342	*9.515*	*8.314*	*26.1%*	*8.832*	*8.907*
280-270 Cavity Albedo	-2.655	-2.775		-3.317	*-3.236*		-3.003	-2.457	-3.317	*-2.457*	*-2.907*	*29.6%*	*-3.134*	*-3.157*
320-270 Thermostat	-2.467	-2.764		-3.103	*-3.046*		-2.808	-3.051	-3.103	-2.467	*-2.873*	*22.1%*	*-3.297*	*-3.301*
290-270 South Shading	-2.324	-1.659		-1.957	*-2.261*		-2.065	-1.283	-2.324	-1.283	*-1.925*	*54.1%*	*-2.500*	*-2.517*
300-270 E&W Windows	-3.226	-2.834		-3.163	*-3.250*		-3.043	-2.933	*-3.250*	-2.834	*-3.075*	*13.5%*	*-3*	*-3.267*
310-300 E&W Shading	-1.570	-1.266		-1.420	*-1.629*		-1.994		-1.994	-1.266	*-1.576*	*46.2%*	*-2*	*-2.381*
PEAK HEATING [kW]									Statistics for Example Results					
CASES	ESP DMU	BLAST US-IT	DOE21D NREL	SRES-SUN NREL	SRES* BRE	S3PAS SPAIN	TSYS BEL-BRE	TASE FINLAND	Min	Max	Mean	(Max-Min)/ Mean** (%)	GBS Sep 2013 Autodesk	GBS v3.4 Autodesk
200-195 Surface Convection	0.647								0.647	0.647	0.647	0.0%		
210-200 Ext IR (Int IR "off")	0.050								0.050	0.050	0.050	0.0%		
220-215 Ext IR (Int IR "on")	0.080								0.080	0.080	0.080	0.0%	0.124	0.160
215-200 Int IR (Ext IR "off")	0.136								0.136	0.136	0.136	0.0%		
220-210 Int IR (Ext IR "on")	0.166	0.307					0.356	0.195	0.166	0.356	0.256	74.1%		
230-220 Infiltration	1.519	1.704	1.529	1.584		1.811	1.556	1.587	1.519	1.811	1.613	18.1%	1.515	1.378
240-220 Internal Gains	-0.182	-0.180	-0.183	-0.200		-0.189	-0.183	-0.187	-0.200	-0.180	-0.186	10.7%	-0.180	-0.182
250-220 Ext Solar Abs.	-0.001	-0.001	0.000	0.000		-0.007	0.000	0.005	-0.007	0.005	-0.001	2100.0%	0.235	-0.009
270-220 South Windows	-0.004	-0.003		-0.034			0.000	0.218	-0.034	0.218	0.035	711.9%	0.223	-0.024
280-270 Cavity Albedo	0.001	0.001		0.024			0.000	0.021	0.000	0.024	0.009	255.3%	-0.010	-0.010
320-270 Thermostat	-0.002	-0.002		-0.010			0.000	-0.003	-0.010	0.000	-0.003	294.1%	-0.002	0.000
290-270 South Shading	0.000	0.000		0.000			-0.008	0.000	-0.008	0.000	-0.002	500.0%	0.272	0.273
300-270 E&W Windows	0.151	-0.001		0.020			-0.008	0.032	-0.008	0.151	0.039	411.4%	0.293	0.294
310-300 E&W Shading	0.001	0.001		-0.012			0.000		-0.012	0.001	-0.002	520.0%	-0.305	-0.304
PEAK SENSIBLE COOLING [kW]									Statistics for Example Results					
CASES	ESP DMU	BLAST US-IT	DOE21D NREL	SRES-SUN NREL	SRES* BRE	S3PAS SPAIN	TSYS BEL-BRE	TASE FINLAND	Min	Max	Mean	(Max-Min)/ Mean** (%)	GBS Sep 2013 Autodesk	GBS v3.4 Autodesk
200-195 Surface Convection	0.212								0.212	0.212	0.212	0.0%		
210-200 Ext IR (Int IR "off")	-0.387								-0.387	-0.387	-0.387	0.0%		
220-215 Ext IR (Int IR "on")	-0.447								-0.447	-0.447	-0.447	0.0%	-0.110	-0.227
215-200 Int IR (Ext IR "off")	0.144								0.144	0.144	0.144	0.0%		
220-210 Int IR (Ext IR "on")	0.084	0.149					0.111	0.071	0.071	0.149	0.104	75.2%		
230-220 Infiltration	0.499	0.480	0.518	0.535		0.485	0.529	0.536	0.480	0.536	0.512	10.9%	0.747	0.751
240-220 Internal Gains	0.179	0.181	0.182	0.200		0.183	0.183	0.184	0.179	0.200	0.185	11.4%	0.069	0.177
250-220 Ext Solar Abs.	2.800	1.870	1.668	1.250		1.043	2.049	3.699	1.043	3.699	2.054	129.3%	1.296	1.494
270-220 South Windows	5.796	5.475		5.894			5.585	5.654	5.475	5.894	5.681	7.4%	5.721	5.749
280-270 Cavity Albedo	-1.912	-2.010		-2.014			-1.978	-1.631	-2.014	-1.631	-1.909	20.1%	-1.882	-1.891
320-270 Thermostat	-0.655	-0.695		-0.681			-0.586	-0.726	-0.726	-0.586	-0.669	20.9%	-1.141	-0.872
290-270 South Shading	-0.087	-0.086		-0.258			-0.561	-0.246	-0.561	-0.086	-0.248	191.9%	-0.222	-0.241
300-270 E&W Windows	-2.952	-2.548		-2.577			-2.486	-1.938	-2.952	-1.938	-2.500	40.6%	-2.596	-2.336
310-300 E&W Shading	-0.556	-0.344		-0.493			-0.689		-0.689	-0.344	-0.520	66.3%	-0.888	-0.934

* SRES-BRE (SERIRES 1.2) simulations for cases with interior solar absorptance = 0.9 have an input error that likely affects annual heating and cooling load sensitivities by <0.2 MWh/y. (<6% for heating, <3% for cooling); see Section B7.2. Affected results involving Cases 270 and 290 throiugh 320 are indicated with italics.

** ABS[(Max-Min) / (Mean of Example Simulation Results)]

ASHRAE Standard 140-2011 Test Results Comparison for Section 5.2 - Building Thermal Envelope and Fabric Load Tests
Autodesk Green Building Studio July 2013 (GBS) vs. Annex B8, Section B8.1 Example Results
By Autodesk Green Building Studio (Autodesk), 08-Sep-2013

Note: The statistics in the tables below are based on the Standard 140 informative example results.
These statistics do not have any substantial importance and are not to be interpreted as acceptance criteria.

Table B8-9. Low Mass In-Depth (Cases 395 thru 440) Sensitivity Tests

ANNUAL HEATING [MWh]									Statistics for Example Results					
CASES	ESP DMU	BLAST US-IT	DOE21D NREL	SRES-SUN NREL	SRES BRE	S3PAS SPAIN	TSYS BEL-BRE	TASE FINLAND	Min	Max	Mean	(Max-Min)/ Mean** (%)	GBS Sep 2013 GBS Sep 2013	GBS v3.4 GBS v3.4
400-395 Surf. Conv. & IR	1.916	2.276	2.935	2.767	2.772	2.320	2.311	2.487	1.916	2.935	2.473	41.2%	2.546	255.1%
410-400 Infiltration	1.696	1.798	1.736	1.760	1.761	1.732	1.770	1.759	1.696	1.798	1.752	5.8%	0.942	93.4%
420-410 Internal Gains	-1.298	-1.263	-1.355	-1.361	-1.361	-1.245	-1.239	-1.222	-1.361	-1.222	-1.293	10.8%	-1.344	-1.345
430-420 Ext Solar Abs.	-1.869	-1.122	-1.324	-1.187	-1.187	-1.112	-1.197	-1.353	-1.869	-1.112	-1.294	58.5%	-1.536	-1.538
600-430 South Windows	-1.133	-1.715	-2.118	-1.952	-1.590	-1.780	-1.628	-1.148	-2.118	-1.133	-1.633	60.3%	-1.863	-1.868
440-600 Cavity Albedo	0.153	0.214		0.426	0.215		0.226	0.280	0.153	0.426	0.252	108.2%	0.283	0.284
ANNUAL SENSIBLE COOLING [MWh]									Statistics for Example Results					
CASES	ESP DMU	BLAST US-IT	DOE21D NREL	SRES-SUN NREL	SRES BRE	S3PAS SPAIN	TSYS BEL-BRE	TASE FINLAND	Min	Max	Mean	(Max-Min)/ Mean** (%)	GBS Sep 2013 Autodesk	GBS v3.4 Autodesk
400-395 Surf. Conv. & IR	0.000	0.029	0.002	0.045	0.044	0.032	0.034	0.033	0.000	0.045	0.027	164.1%		0.001
410-400 Infiltration	0.000	0.019	0.008	0.023	0.026	0.021	0.022	0.021	0.000	0.026	0.018	148.2%	0.003	0.003
420-410 Internal Gains	0.011	0.088	0.041	0.105	0.104	0.091	0.090	0.078	0.011	0.105	0.076	123.6%	0.029	0.030
430-420 Ext Solar Abs.	0.531	0.470	0.371	0.515	0.496	0.409	0.460	0.732	0.371	0.732	0.498	72.5%	0.895	0.910
600-430 South Windows	5.595	5.816	6.657	6.574	7.280	5.929	5.875	5.903	5.595	7.280	6.204	27.2%	6.683	6.754
440-600 Cavity Albedo	-2.170	-2.261		-2.604	-2.760		-2.517	-2.094	-2.760	-2.094	-2.401	27.7%	-2.944	-296.9%
PEAK HEATING [kW]									Statistics for Example Results					
CASES	ESP DMU	BLAST US-IT	DOE21D NREL	SRES-SUN NREL	SRES BRE*	S3PAS SPAIN	TSYS BEL-BRE	TASE FINLAND	Min	Max	Mean	(Max-Min)/ Mean** (%)	GBS Sep 2013 Autodesk	GBS v3.4 Autodesk
400-395 Surf. Conv. & IR	0.805	1.071	1.148	1.310		1.079	1.115	1.250	0.805	1.310	1.111	45.4%	1	99.0%
410-400 Infiltration	0.758	0.844	0.757	0.792		0.885	0.778	0.794	0.757	0.885	0.801	16.0%	1	0.492
420-410 Internal Gains	-0.182	-0.180	-0.183	-0.200		-0.183	-0.183	-0.188	-0.200	-0.180	-0.186	10.8%	0	-0.182
430-420 Ext Solar Abs.	-0.001	0.000	0.000	0.000		0.000	0.000	0.011	-0.001	0.011	0.001	840.0%	0	0.282
600-430 South Windows	-0.005	-0.004	-0.005	-0.029		-0.007	0.000	0.217	-0.029	0.217	0.024	1031.1%	0	-0.039
440-600 Cavity Albedo	0.002	0.002		0.019			0.000	0.022	0.000	0.022	0.009	244.4%	0.000	0.000
PEAK SENSIBLE COOLING [kW]									Statistics for Example Results					
CASES	ESP DMU	BLAST US-IT	DOE21D NREL	SRES-SUN NREL	SRES BRE*	S3PAS SPAIN	TSYS BEL-BRE	TASE FINLAND	Min	Max	Mean	(Max-Min)/ Mean** (%)	GBS Sep 2013 Autodesk	GBS v3.4 Autodesk
400-395 Surf. Conv. & IR	0.000	0.219	0.265	0.272		0.256	0.251	0.227	0.000	0.272	0.213	127.8%		0.193
410-400 Infiltration	0.035	0.118	0.148	0.148		0.112	0.130	0.138	0.035	0.148	0.118	95.4%	0.125	0.124
420-410 Internal Gains	0.223	0.224	0.218	0.233		0.214	0.195	0.211	0.195	0.233	0.217	17.7%	0	0.297
430-420 Ext Solar Abs.	1.235	0.849	0.796	0.715		0.637	0.861	1.657	0.637	1.657	0.964	105.8%	1	1.442
600-430 South Windows	4.701	4.193	5.229	5.065		4.711	4.688	4.234	4.193	5.229	4.689	22.1%	4.416	456.4%
440-600 Cavity Albedo	-1.648	-1.541		-1.774			-1.800	-1.534	-1.800	-1.534	-1.659	16.0%	-1.827	-180.4%

* SRES-BRE (SERIRES 1.2) simulations did not produce output for this variable.
** ABS[(Max-Min) / (Mean of Example Simulation Results)]

ASHRAE Standard 140-2011 Test Results Comparison for Section 5.2 - Building Thermal Envelope and Fabric Load Tests
Autodesk Green Building Studio July 2013 (GBS) vs. Annex B8, Section B8.1 Example Results
By Autodesk Green Building Studio (Autodesk), 08-Sep-2013

Note: The statistics in the tables below are based on the Standard 140 informative example results.
These statistics do not have any substantial importance and are not to be interpreted as acceptance criteria.

Table B8-10. High Mass Basic and In-Depth Sensitivity Tests

ANNUAL HEATING [MWh]									Statistics for Example Results				GBS Sep 2013	GBS v3.4
CASES	ESP DMU	BLAST US-IT	DOE21D NREL	SRES-SUN NREL	SRES BRE	S3PAS SPAIN	TSYS BEL-BRE	TASE FINLAND	Min	Max	Mean	(Max-Min)/ Mean** (%)	GBS Sep 2013 Autodesk	GBS v3.4 Autodesk
800-430 Mass, w/ Op. Win.	-0.561	-0.535	-0.599	-0.567	-0.586	-0.501	-0.560	-0.649	-0.649	-0.501	-0.570	26.0%	-0.053	-0.060
900-800 Himass, S. Win.	-3.698	-4.343	-5.356	-4.714	-4.612	-4.431	-4.285	-3.820	-5.356	-3.698	-4.407	37.6%	-4.674	-4.677
900-810 Himass, Int. Sol. Abs.	-0.669	-0.836		-1.107	-0.840		-0.912	-0.921	-1.107	-0.669	-0.881	49.7%	-0.486	-0.482
910-610 Mass, w/ S. Shade	-2.780	-2.944	-3.532	-3.106	-3.338	-2.908	-2.873	-3.163	-3.532	-2.780	-3.081	24.4%	-3.062	-3.067
920-620 Mass, w/ E&W Win.	-1.300	-1.297	-1.689	-1.461	-1.676	-1.329	-1.297	-1.428	-1.689	-1.297	-1.435	27.3%	-1.604	-1.620
930-630 Mass w/ E&W Shade	-0.907	-1.012	-1.134	-1.128	-1.273	-0.927	-0.884		-1.273	-0.884	-1.038	37.5%	-1.022	-1.031
940-640 Mass, w/ Htg. Setback	-1.958	-1.867	-2.304	-2.024	-2.392	-1.886	-1.963	-1.986	-2.392	-1.867	-2.048	25.6%	-1.644	-1.645
ANNUAL SENSIBLE COOLING [MWh]									Statistics for Example Results					
CASES	ESP DMU	BLAST US-IT	DOE21D NREL	SRES-SUN NREL	SRES BRE	S3PAS SPAIN	TSYS BEL-BRE	TASE FINLAND	Min	Max	Mean	(Max-Min)/ Mean** (%)	GBS Sep 2013 Autodesk	GBS v3.4 Autodesk
800-430 Mass, w/ Op. Win.	-0.429	-0.393	-0.367	-0.432	-0.462	-0.368	-0.410	-0.550	-0.550	-0.367	-0.426	42.9%	-0.838	-0.852
900-800 Himass, S. Win.	2.019	2.376	2.400	2.893	3.193	2.377	2.278	2.274	2.019	3.193	2.476	47.4%	3.076	3.145
900-810 Himass, Int. Sol. Abs.	1.080	1.195		1.454	1.707		1.294	0.975	0.975	1.707	1.284	57.0%	1.549	1.581
910-610 Mass, w/ S. Shade	-3.094	-3.318	-3.876	-3.576	-3.924	-3.336	-3.275	-3.739	-3.924	-3.094	-3.517	23.6%	-3.867	-3.886
920-620 Mass, w/ E&W Win.	-1.577	-1.476	-1.894	-1.690	-1.912	-1.554	-1.483	-1.738	-1.912	-1.476	-1.666	26.2%	-1.802	-1.822
930-630 Mass w/ E&W Shade	-1.090	-1.174	-1.223	-1.320	-1.463	-1.050	-1.000		-1.463	-1.000	-1.189	39.0%	-1.150	-1.162
940-640 Mass, w/ Htg. Setback	-3.873	-3.647	-4.419	-3.990	-4.570	-3.758	-3.863	-3.992	-4.570	-3.647	-4.014	23.0%	-4.227	-4.243
950-650 Mass, w/ Night Vent	-4.429	-4.614	-5.257	-4.973	-5.956	-4.537	-4.558	-4.685	-5.956	-4.429	-4.876	31.3%	-4.928	-4.981
PEAK HEATING [kW]									Statistics for Example Results					
CASES	ESP DMU	BLAST US-IT	DOE21D NREL	SRES-SUN NREL	SRES BRE*	S3PAS SPAIN	TSYS BEL-BRE	TASE FINLAND	Min	Max	Mean	(Max-Min)/ Mean** (%)	GBS Sep 2013 Autodesk	GBS v3.4 Autodesk
800-430 Mass, w/ Op. Win.	-0.215	-0.151	-0.141	-0.149		-0.142	-0.144	-0.198	-0.215	-0.141	-0.163	45.4%	-0.282	-0.465
900-800 Himass, S. Win.	-0.377	-0.340	-0.352	-0.378		-0.294	-0.269	-0.142	-0.378	-0.142	-0.307	76.7%	0.223	0.138
900-810 Himass, Int. Sol. Abs.	-0.129	-0.113		-0.155			-0.089	-0.166	-0.166	-0.089	-0.130	59.1%	0.062	0.052
910-610 Mass, w/ S. Shade	-0.579	-0.485	-0.470	-0.494		-0.419	-0.386	-0.553	-0.579	-0.386	-0.484	39.9%	-0.395	-0.382
920-620 Mass, w/ E&W Win.	-0.283	-0.238	-0.241	-0.264		-0.248	-0.214	-0.318	-0.318	-0.214	-0.258	40.4%	-0.280	-0.279
930-630 Mass w/ E&W Shade	-0.237	-0.209	-0.193	-0.238		-0.214	-0.178		-0.238	-0.178	-0.211	28.5%	-0.256	-0.250
940-640 Mass, w/ Htg. Setback	-1.252	-0.458	-0.278	-0.414		-0.230	-0.600	-0.526	-1.252	-0.230	-0.537	190.4%	0.070	0.074
PEAK SENSIBLE COOLING [kW]									Statistics for Example Results					
CASES	ESP DMU	BLAST US-IT	DOE21D NREL	SRES-SUN NREL	SRES BRE*	S3PAS SPAIN	TSYS BEL-BRE	TASE FINLAND	Min	Max	Mean	(Max-Min)/ Mean** (%)	GBS Sep 2013 Autodesk	GBS v3.4 Autodesk
800-430 Mass, w/ Op. Win.	-0.908	-0.805	-0.684	-0.410		-0.547	-0.816	-1.220	-1.220	-0.410	-0.770	105.2%	-1.229	-1.311
900-800 Himass, S. Win.	2.303	2.188	2.715	2.519		2.306	2.584	2.099	2.099	2.715	2.388	25.8%	2.874	2.905
900-810 Himass, Int. Sol. Abs.	1.036	0.798		0.880			1.223	0.595	0.595	1.223	0.906	69.3%	1.104	1.116
910-610 Mass, w/ S. Shade	-3.773	-3.324	-3.728	-3.094		-3.384	-2.883	-2.999	-3.773	-2.883	-3.312	26.9%	-3.416	-3.107
920-620 Mass, w/ E&W Win.	-1.249	-1.142	-1.321	-1.106		-1.226	-1.225	-1.591	-1.591	-1.106	-1.266	38.3%	-1.162	-1.159
930-630 Mass w/ E&W Shade	-1.199	-1.158	-1.200	-1.036		-1.179	-1.110		-1.200	-1.036	-1.147	14.3%	-1.064	-1.060
940-640 Mass, w/ Htg. Setback	-3.273	-2.737	-3.118	-2.905		-2.916	-2.875	-3.314	-3.314	-2.737	-3.020	19.1%	-2.723	-2.914
950-650 Mass, w/ Night Vent	-3.998	-3.210	-3.852	-3.501		-3.466	-3.692	-3.812	-3.998	-3.210	-3.647	21.6%	-3.171	-3.310

* SRES-BRE (SERIRES 1.2) simulations did not produce output for this variable.

** ABS[(Max-Min) / (Mean of Example Simulation Results)]

ASHRAE Standard 140-2011 Test Results Comparison for Section 5.2 - Building Thermal Envelope and Fabric Load Tests
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Note: The statistics in the tables below are based on the Standard 140 informative example results.
These statistics do not have any substantial importance and are not to be interpreted as acceptance criteria.

Table B8-11. Annual Transmissivity Coefficient of Windows

(ANNUAL UNSHADED TRANSMITTED SOLAR RADIATION)/(ANNUAL UNSHADED INCIDENT SOLAR RADIATION)

Simulation Model:	ESP	DOE21D	SRES-SUN	SRES	S3PAS	TSYS	TASE	Statistics for Example Results				GBS Sep 2013	GBS v3.4
Organization or Country:	DMU	NREL	NREL	BRE	SPAIN	BEL-BRE	FINLAND					Autodesk	Autodesk
Case								Min	Max	Mean	(Max-Min)/ Mean* (%)		
620 West	0.674	0.681	0.687	0.657	0.641	0.654	0.648	0.641	0.687	0.663	7.0%	0.799	0.799
600 South	0.650	0.671	0.652	0.650	0.628	0.647	0.623	0.623	0.671	0.646	7.5%	0.791	0.791

* ABS[(Max-Min) / (Mean of Example Simulation Results)]

Table B8-12. Annual Shading Coefficient of Window Shading Devices: Overhangs & Fins

(1-(ANNUAL SHADED TRANSMITTED SOLAR RADIATION)/(ANNUAL UNSHADED TRANSMITTED SOLAR RADIATION))

Simulation Model:	ESP	DOE21D	SRES-SUN	SRES	S3PAS	TSYS	TASE	Statistics for Example Results				GBS Sep 2013	GBS v3.4
Organization or Country:	DMU	NREL	NREL	BRE	SPAIN	BEL-BRE	FINLAND					Autodesk	Autodesk
Case								Min	Max	Mean	(Max-Min)/ Mean* (%)		
630/620 West	0.182	0.346	0.196	0.216	0.329	0.339		0.182	0.346	0.268	61.2%	0.376	0.377
610/600 South	0.170	0.209	0.165	0.188	0.183	0.205	0.115	0.115	0.209	0.177	53.5%	0.209	0.209

* ABS[(Max-Min) / (Mean of Example Simulation Results)]

Table B8-13. Case 600 Annual Incident Solar Radiation (kWh/m^2)

Simulation Model:	ESP	DOE21D	SRES-SUN	SRES	S3PAS	TSYS	TASE	Statistics for Example Results				GBS Sep 2013	GBS v3.4
Organization or Country:	DMU	NREL	NREL	BRE	SPAIN	BEL-BRE	FINLAND					Autodesk	Autodesk
Case								Min	Max	Mean	(Max-Min)/ Mean* (%)		
North	427	434	456	407	457	367	453	367	457	429	20.9%	439	450
East	959	1155	1083	1217	1082	1101	962	959	1217	1080	23.9%	1156	1167
West	1086	1079	1003	857	1002	1012	1090	857	1090	1018	22.9%	1082	1092
South	1456	1566	1476	1468	1474	1522	1468	1456	1566	1490	7.4%	1567	1577
Horizontal	1797	1831	1832	1832	1832	1832	1832	1797	1832	1827	1.9%	1832	1832

* ABS[(Max-Min) / (Mean of Example Simulation Results)]

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Autodesk Green Building Studio July 2013 (GBS) vs. Annex B8, Section B8.1 Example Results
By Autodesk Green Building Studio (Autodesk), 08-Sep-2013

Note: The statistics in the tables below are based on the Standard 140 informative example results.
These statistics do not have any substantial importance and are not to be interpreted as acceptance criteria.

Table B8-14. Case 600 Annual Transmitted Solar Radiation - Unshaded (kWh/m^2)

Simulation Model:	ESP	DOE21D	SRES-SUN	SRES	S3PAS	TSYS	TASE	Statistics for Example Results				GBS Sep 2013	GBS v3.4
Organization or Country:	DMU	NREL	NREL	BRE	SPAIN	BEL-BRE	FINLAND				(Max-Min)/	Autodesk	Autodesk
Case								Min	Max	Mean	Mean* (%)		
West	732	735	689	563	642	662	706	563	735	676	25.5%	864	872
South	946	1051	962	954	926	984	914	914	1051	962	14.2%	1239	1247

* ABS[(Max-Min) / (Mean of Example Simulation Results)]

Table B8-15. Case 600 Annual Transmitted Solar Radiation - Shaded (kWh/m^2)

Simulation Model:	ESP	DOE21D	SRES-SUN	SRES	S3PAS	TSYS	TASE	Statistics for Example Results				GBS Sep 2013	GBS v3.4
Organization or Country:	DMU	NREL	NREL	BRE	SPAIN	BEL-BRE	FINLAND				(Max-Min)/	Autodesk	Autodesk
Case								Min	Max	Mean	Mean* (%)		
West	599	481	554	441	431	438		431	599	491	34.2%	539	543
South	785	831	803	775	757	782	809	757	831	792	9.3%	980	986

* ABS[(Max-Min) / (Mean of Example Simulation Results)]

Figure B8-1. BESTEST BASIC Annual Incident Solar Radiation

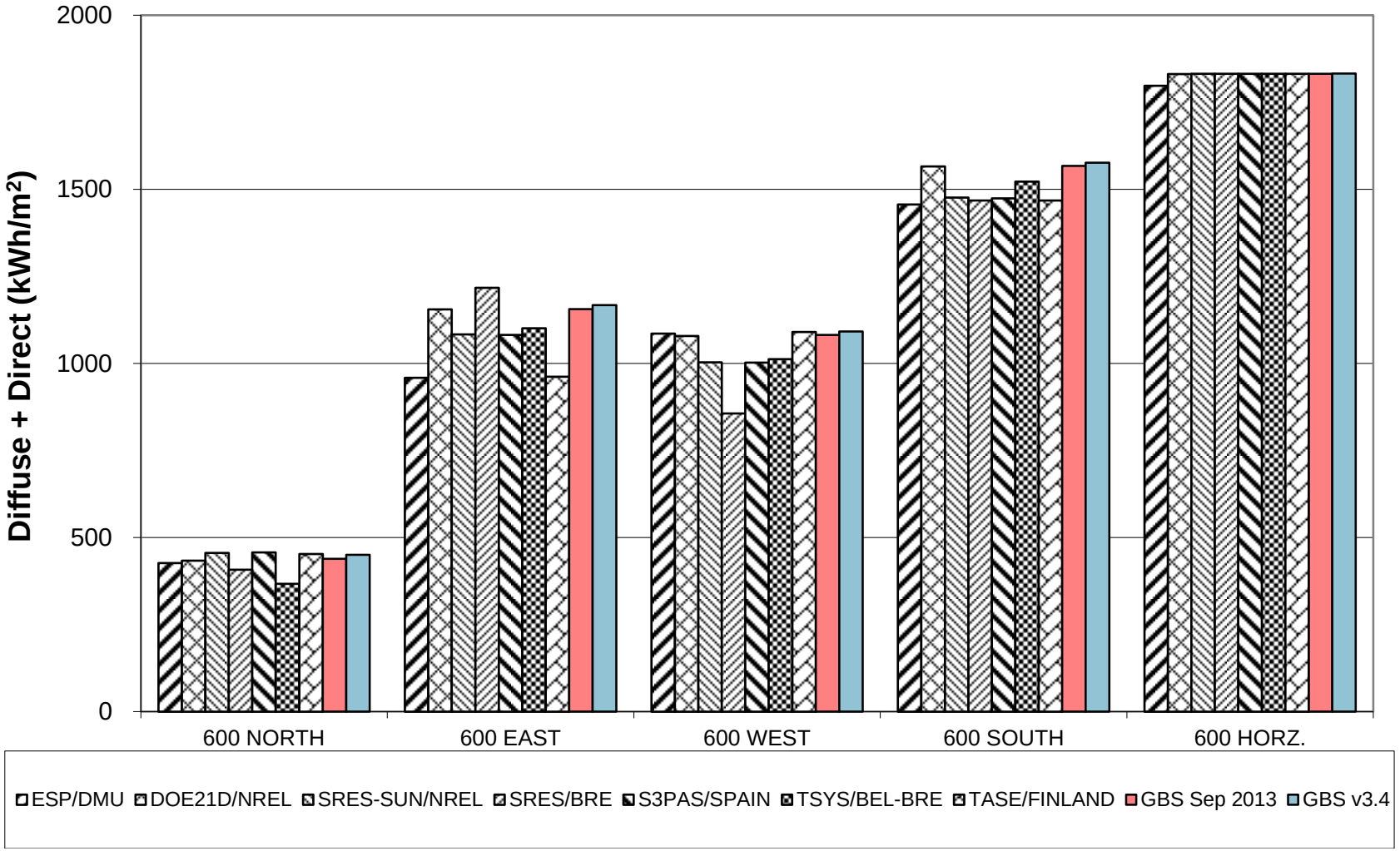


Figure B8-2. BESTEST BASIC
Annual Transmitted Solar Radiation - Unshaded

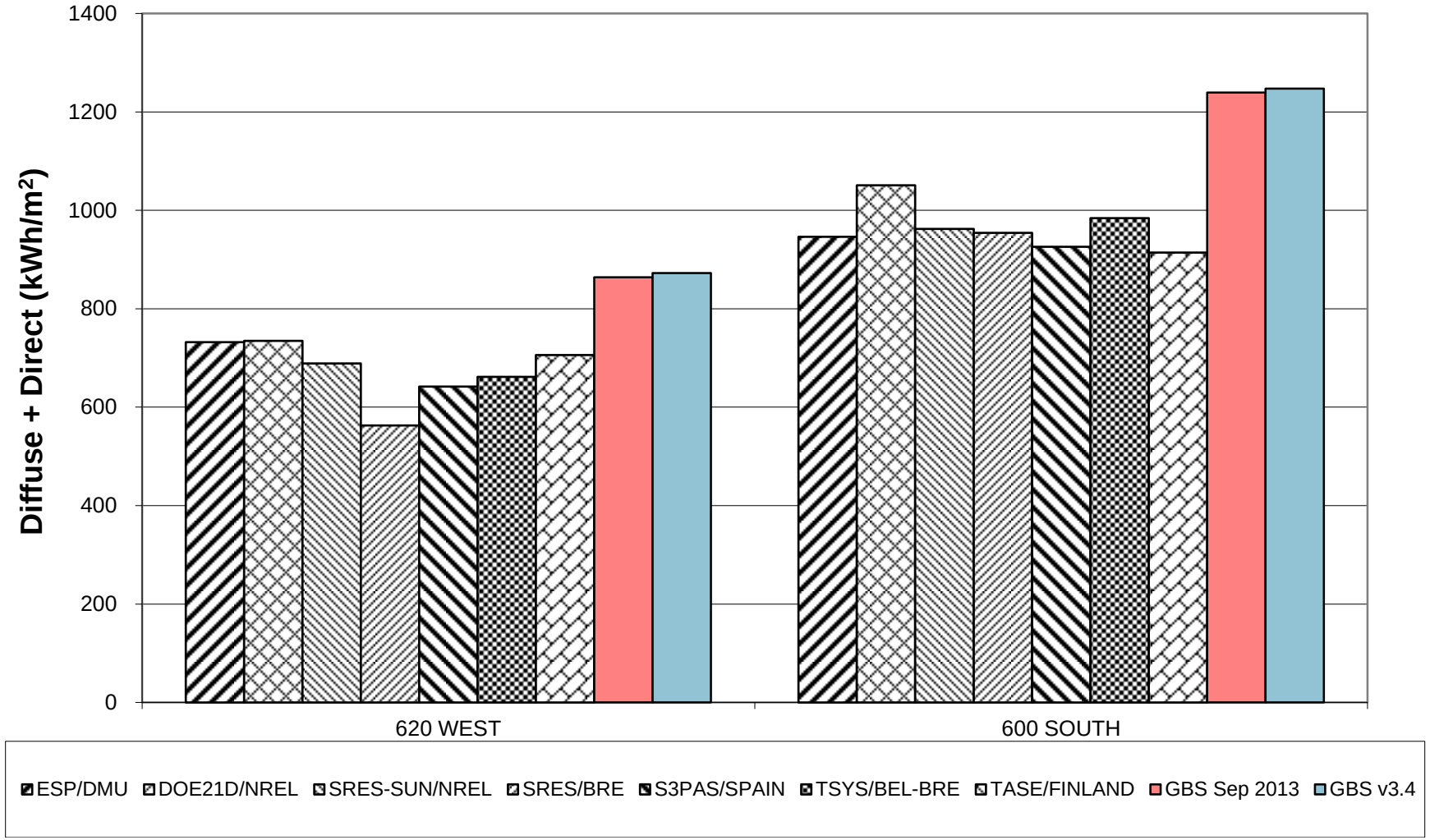


Figure B8-3. BESTEST BASIC
Annual Transmitted Solar Radiation - Shaded

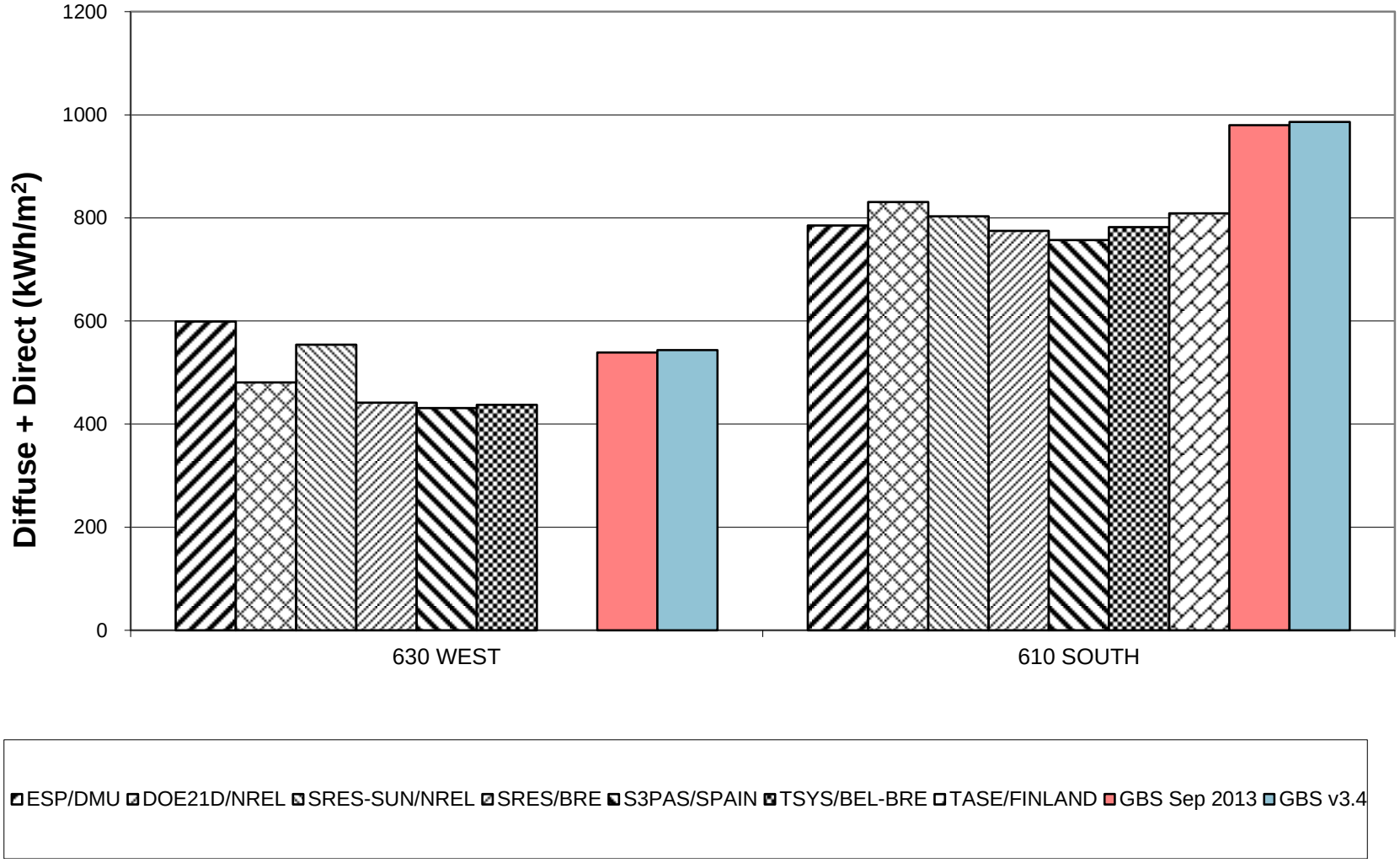


Figure B8-4. BESTEST BASIC
Annual Transmissivity Coefficient of Windows
(Unshaded Transmitted)/(Incident Solar Radiation)

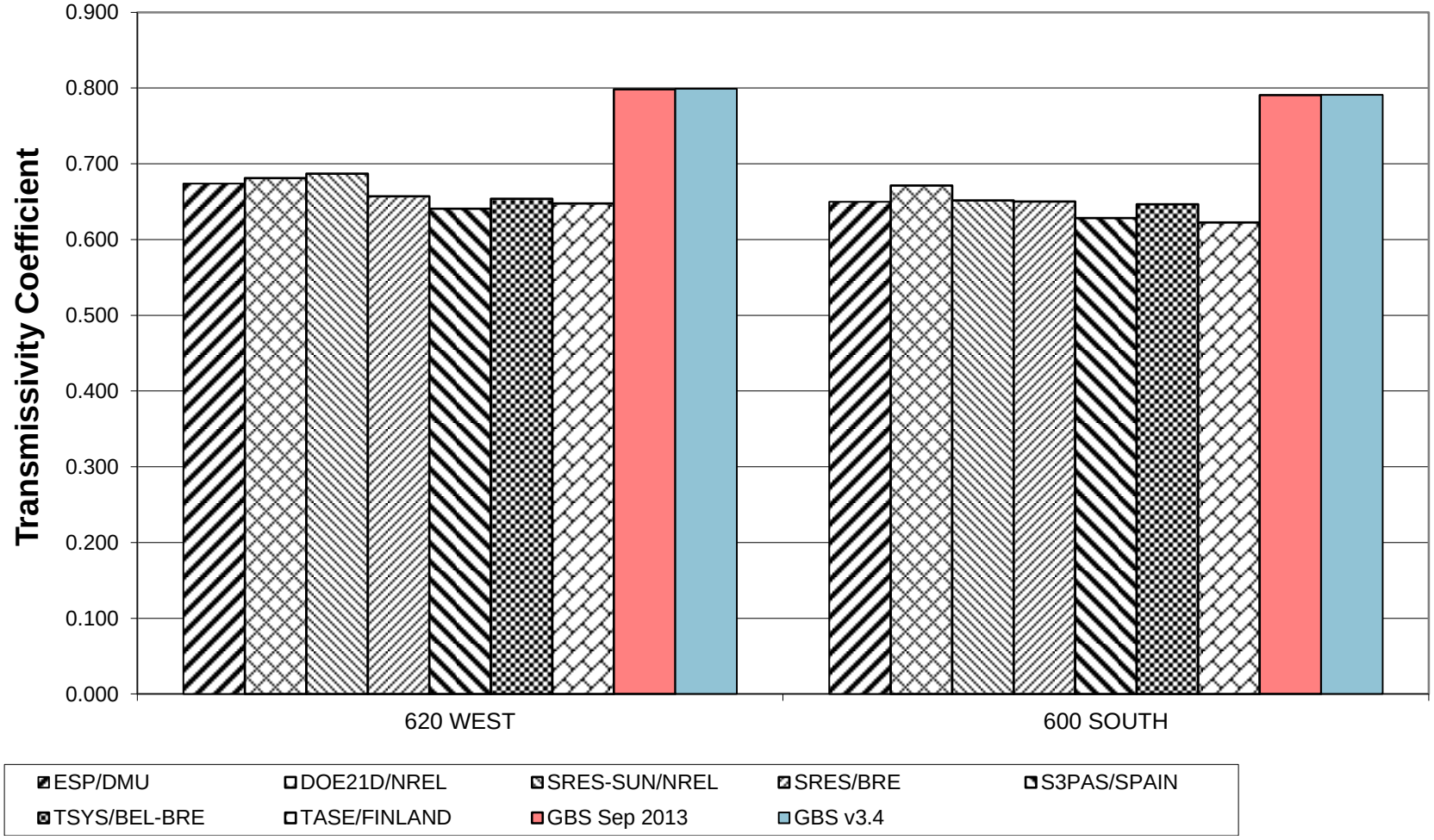


Figure B8-5. BESTEST BASIC Annual Overhang and Fin Shading Coefficients (1-(Shaded)/(Unshaded)) Transmitted Solar Radiation

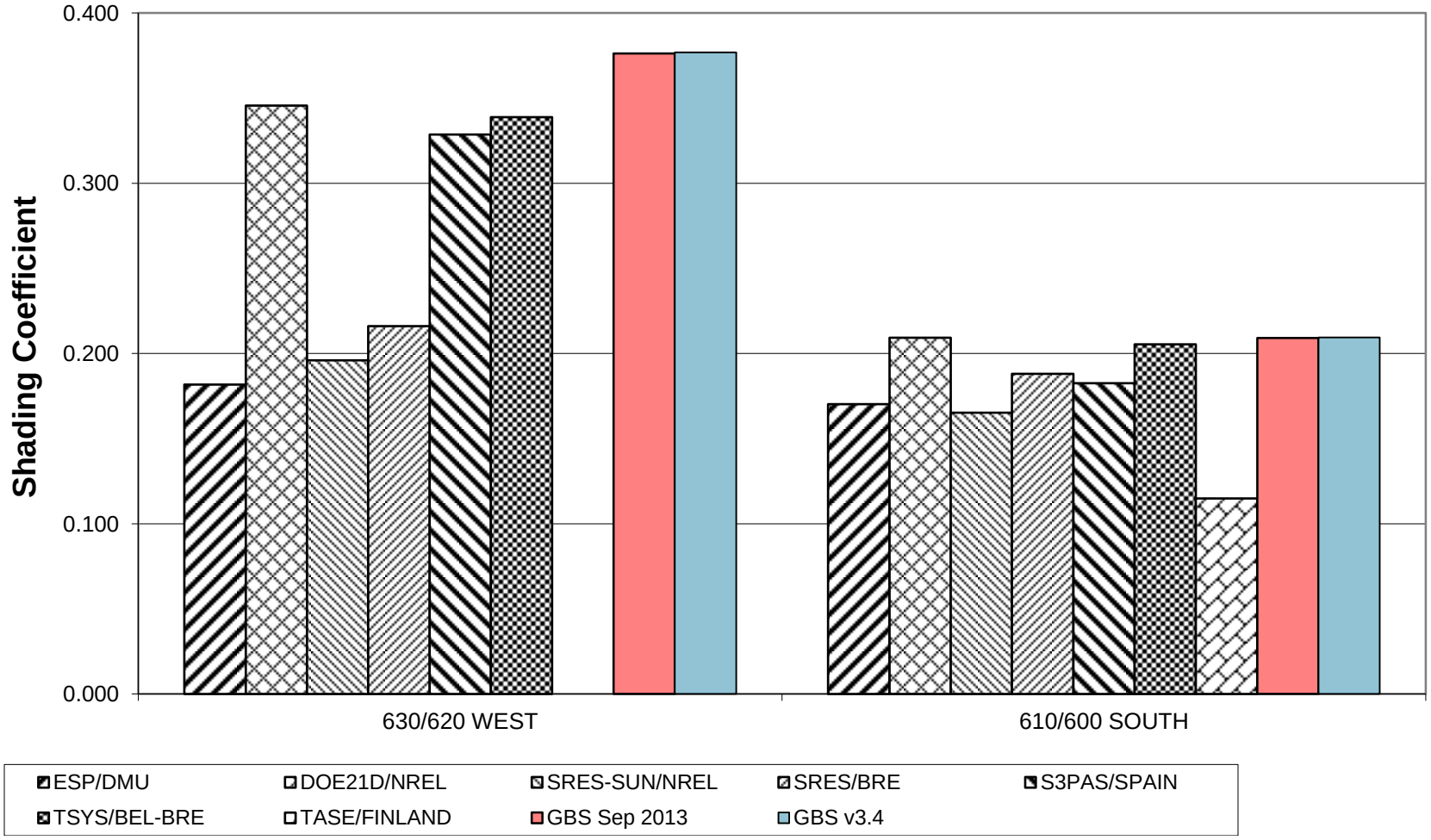


Figure B8-6. BESTEST BASIC Low Mass Annual Heating

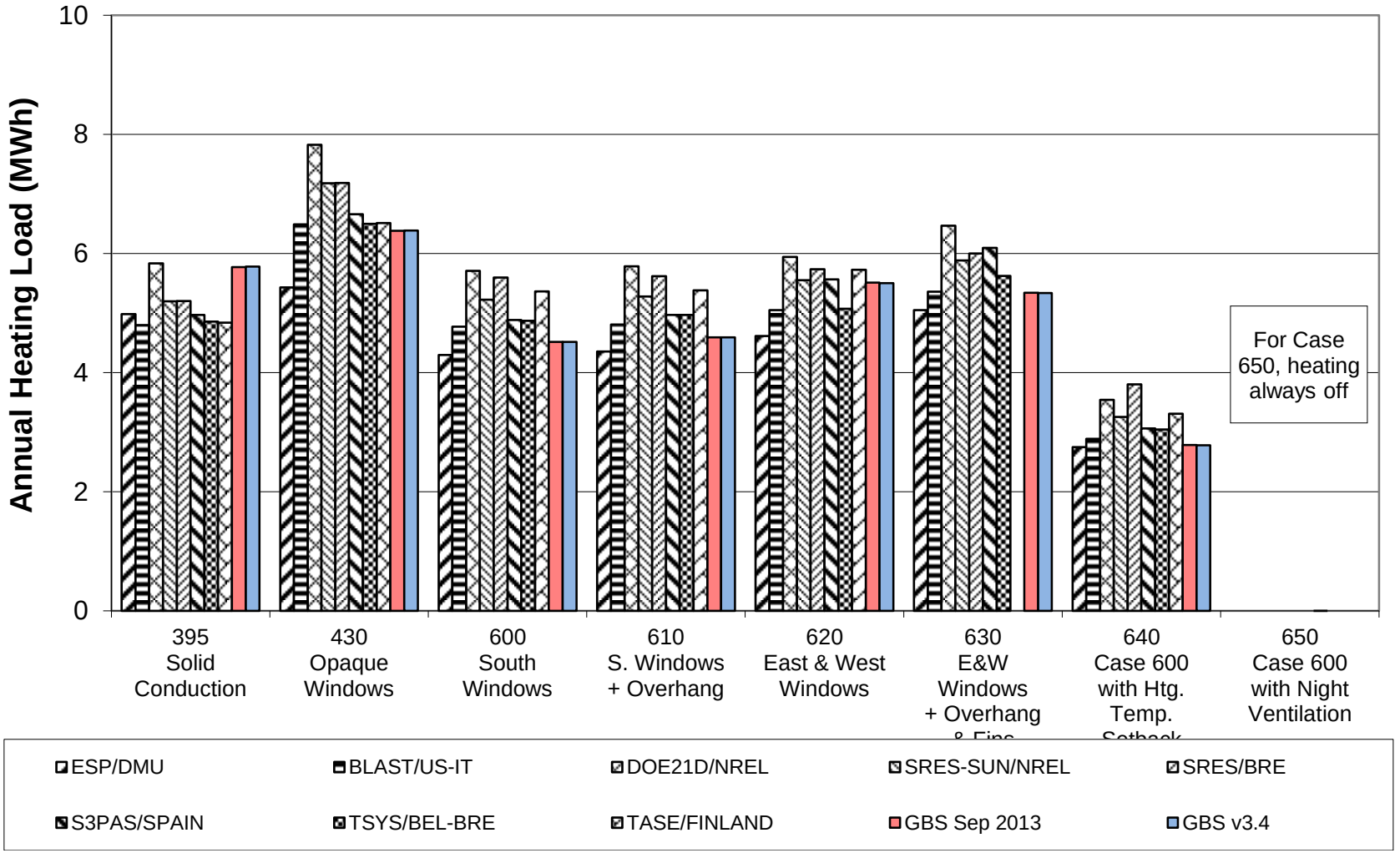


Figure B8-7. BESTEST BASIC Low Mass Annual Sensible Cooling

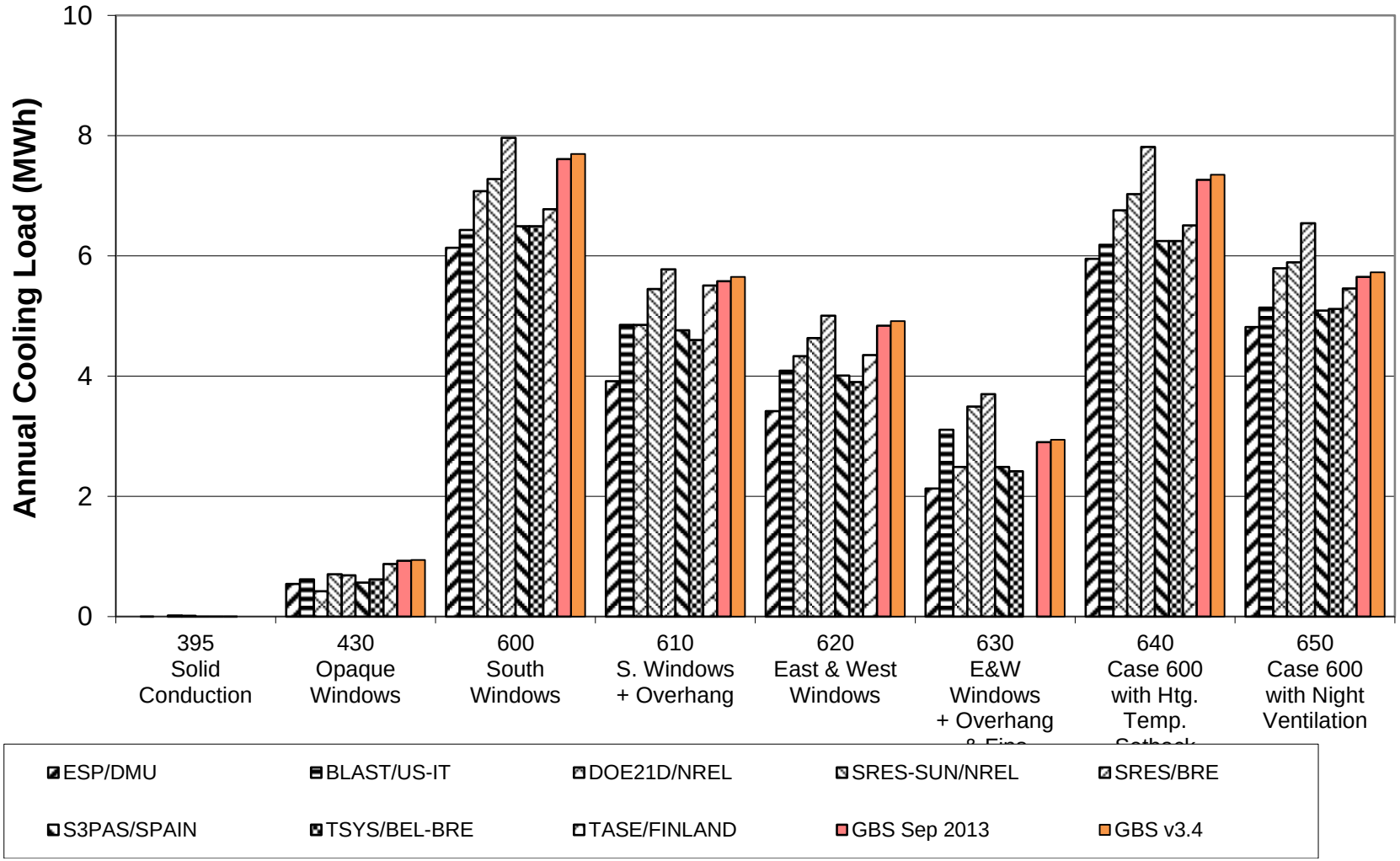


Figure B8-8. BESTEST BASIC Low Mass Peak Heating

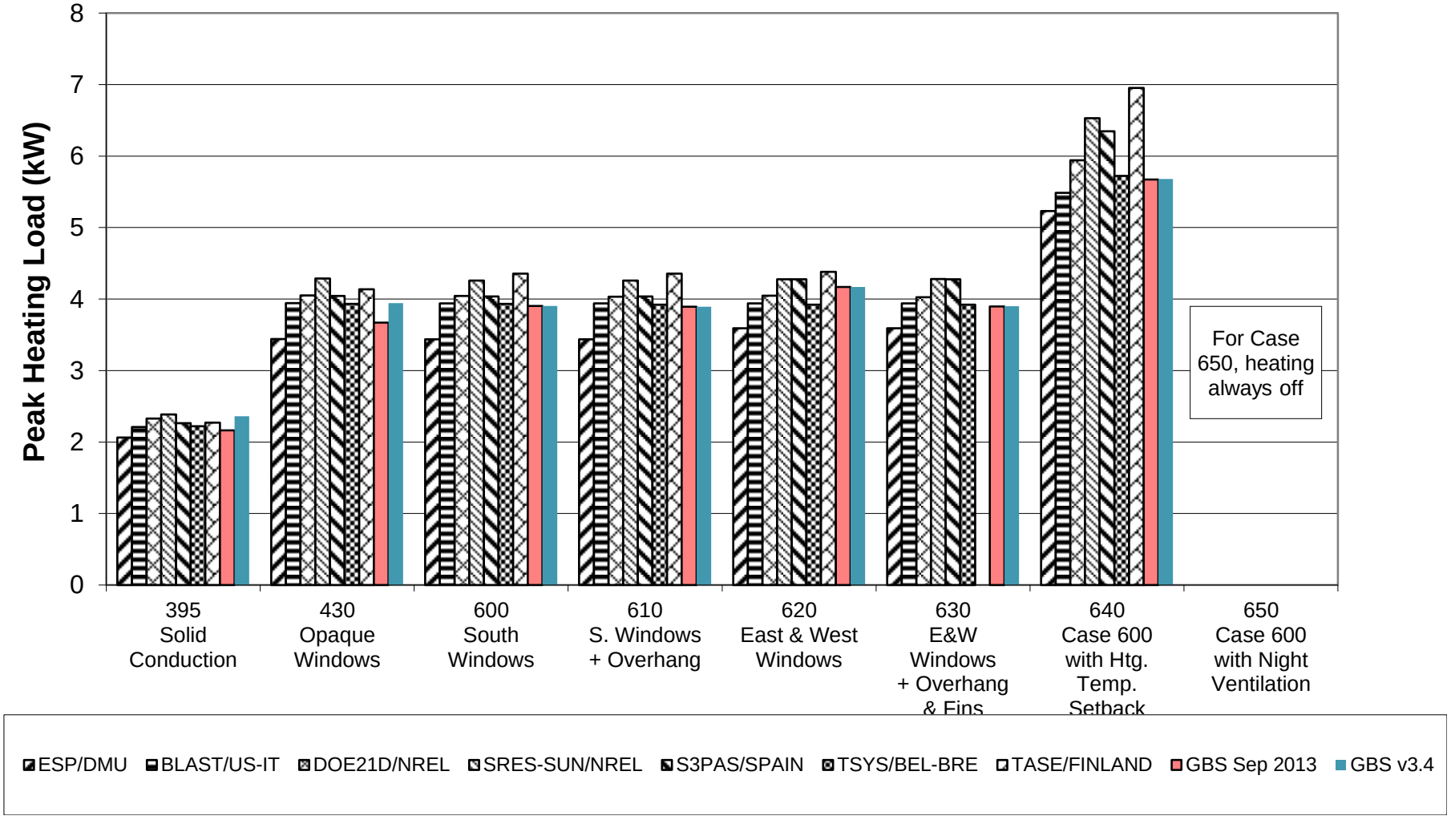


Figure B8-9. BESTEST BASIC Low Mass Peak Sensible Cooling

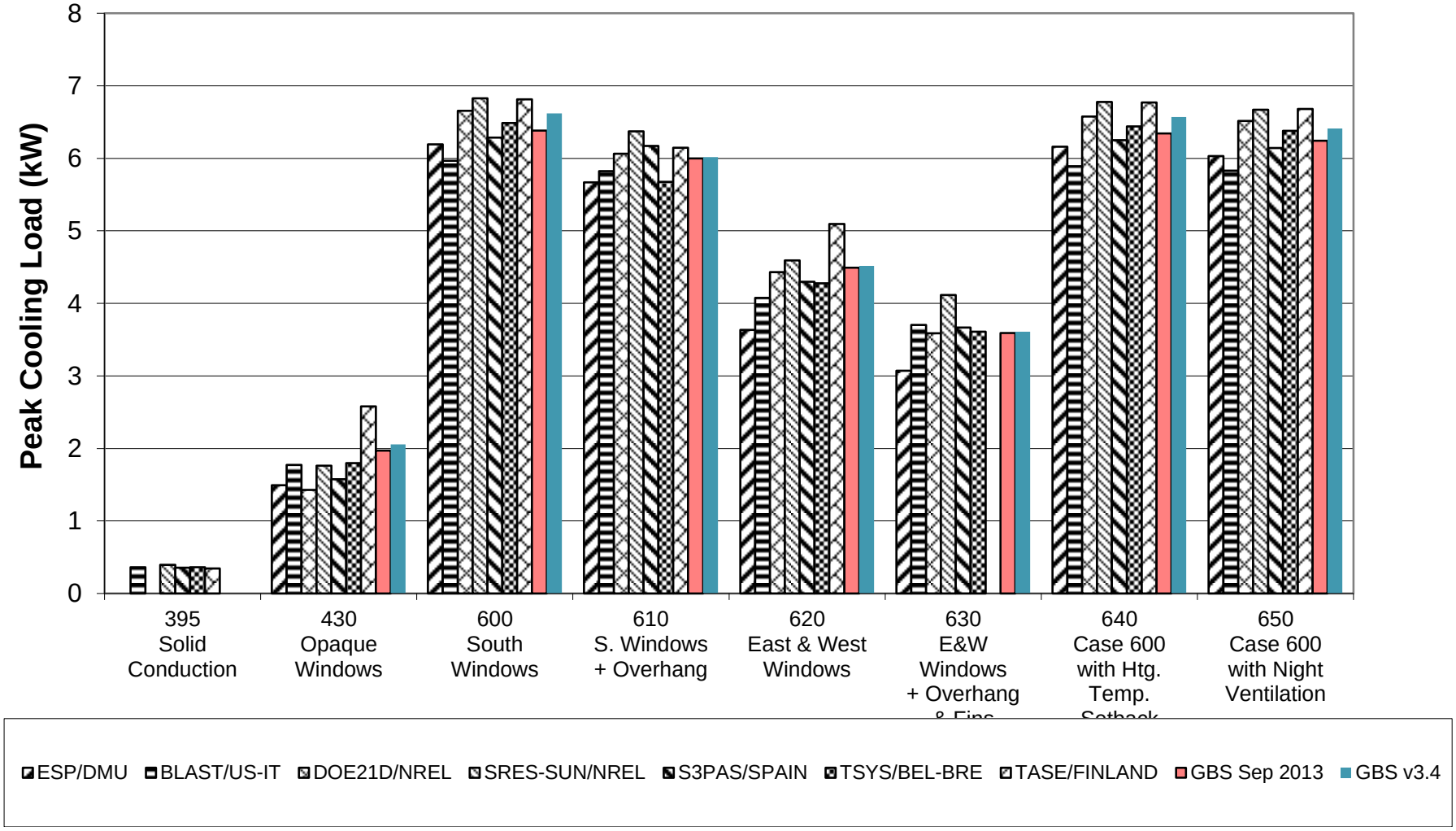


Figure B8-10. BESTEST BASIC High Mass Annual Heating

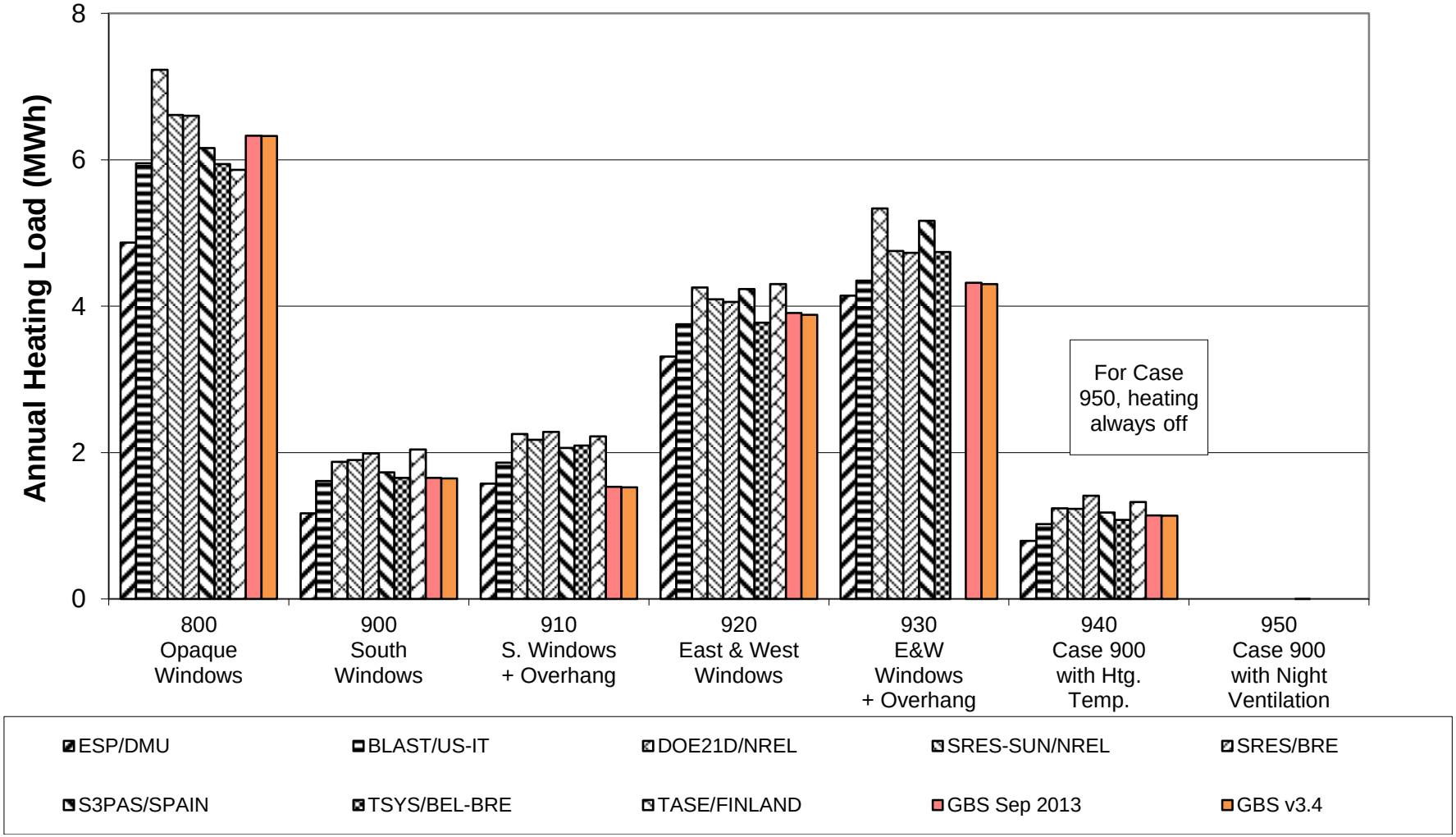


Figure B8-11. BESTEST BASIC High Mass Annual Sensible Cooling

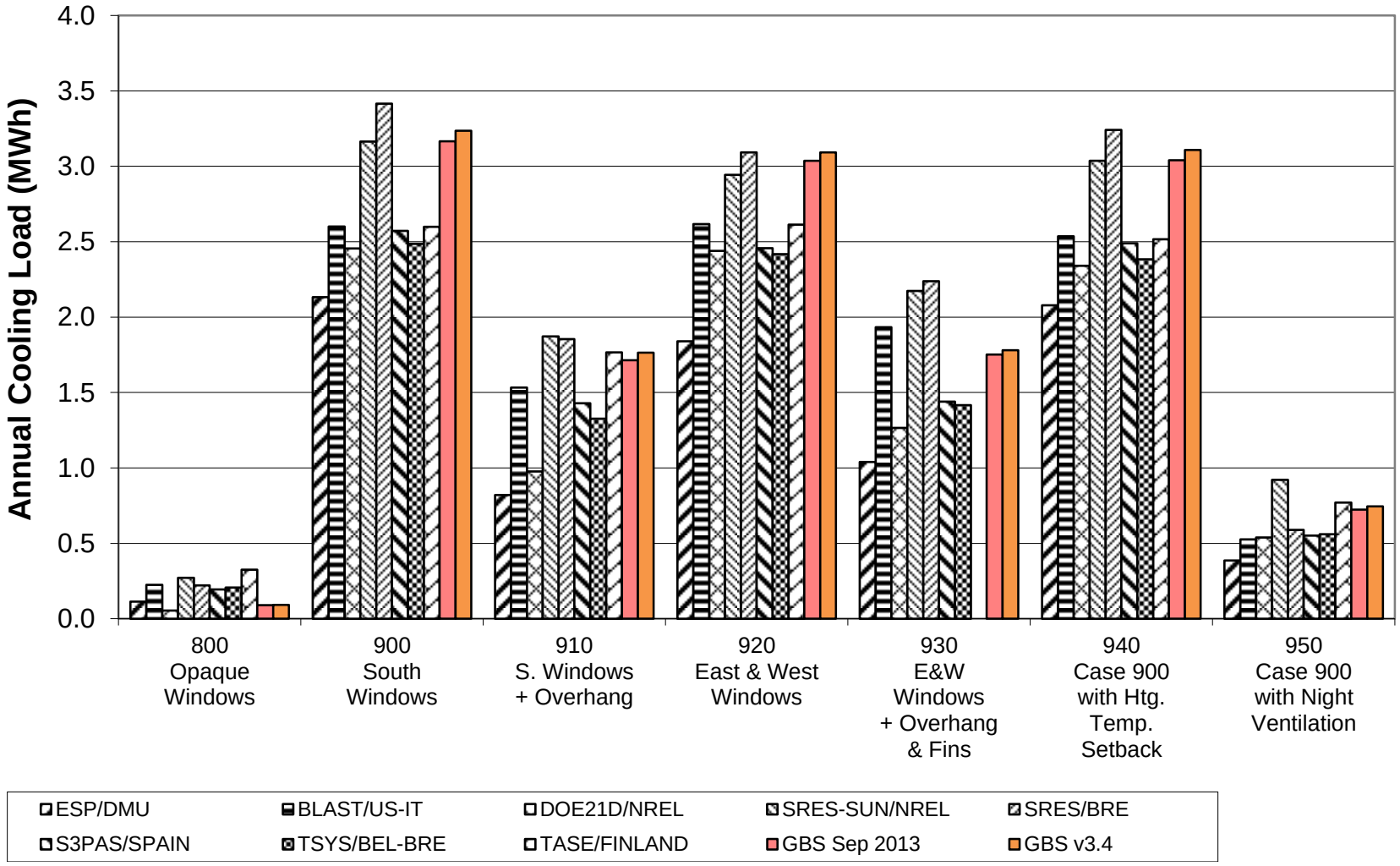


Figure B8-12. BESTEST BASIC High Mass Peak Heating

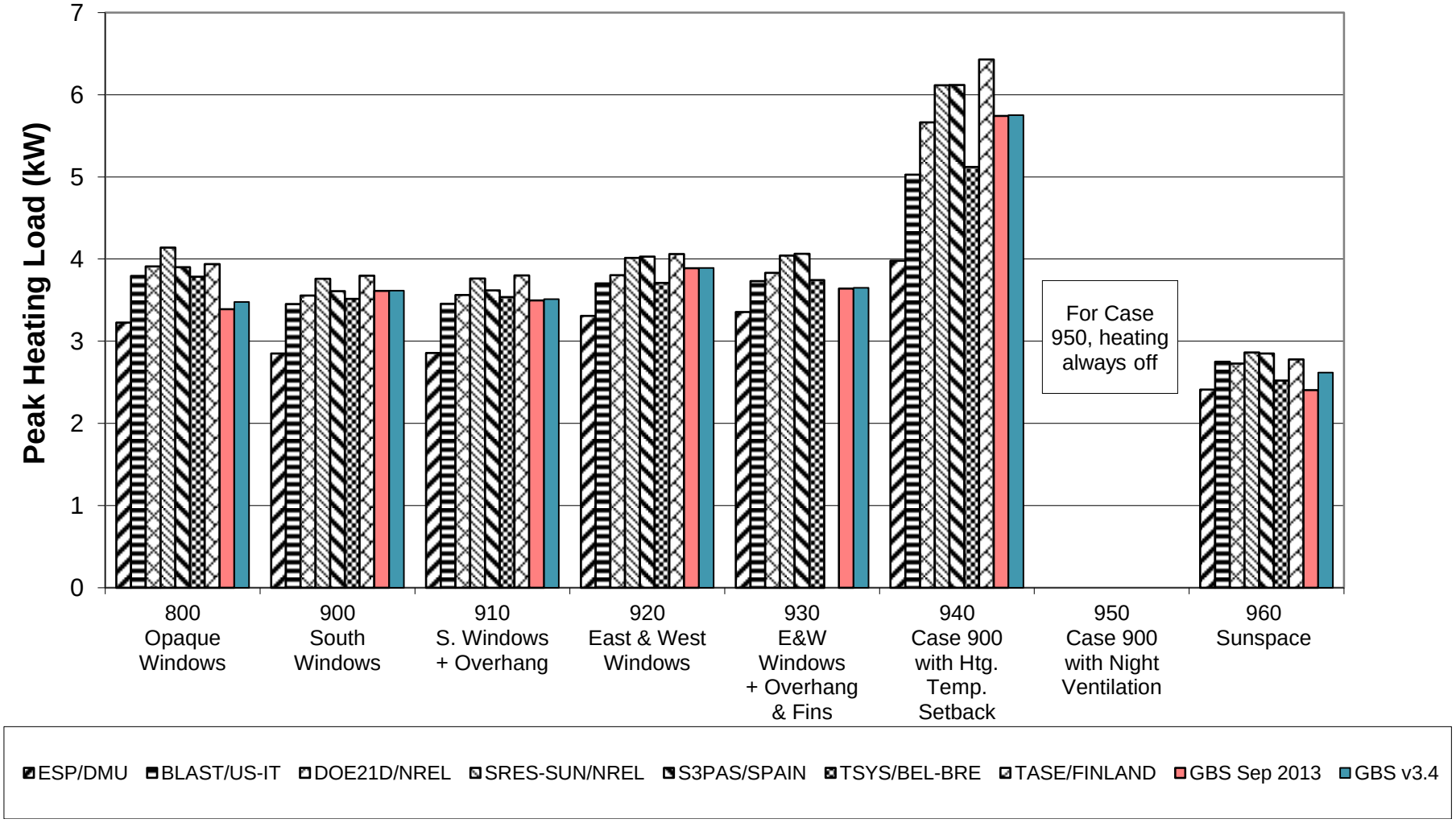


Figure B8-13. BESTEST BASIC High Mass Peak Sensible Cooling

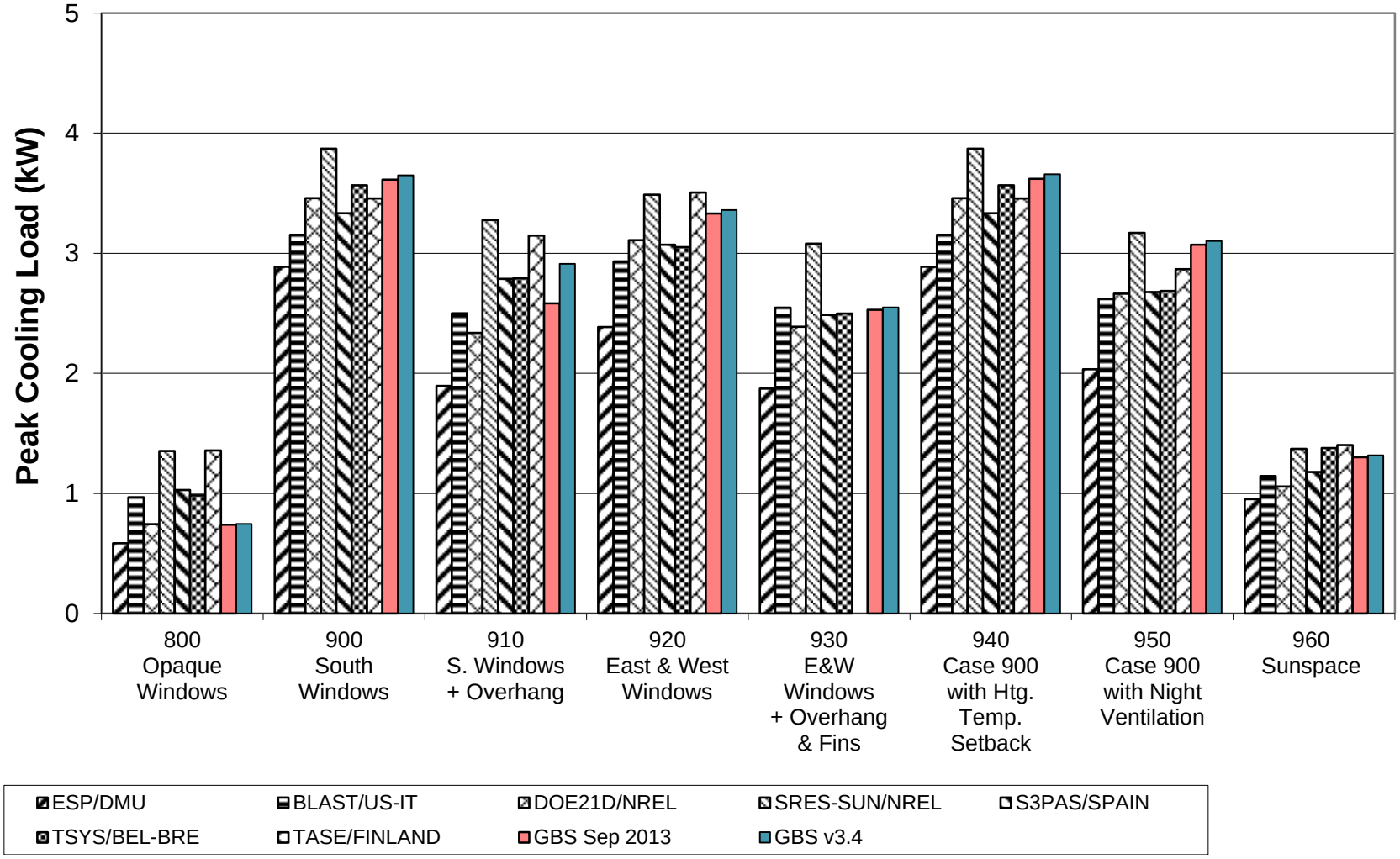


Figure B8-14. BESTEST BASIC Maximum Hourly Annual Temperature Free-Float Cases

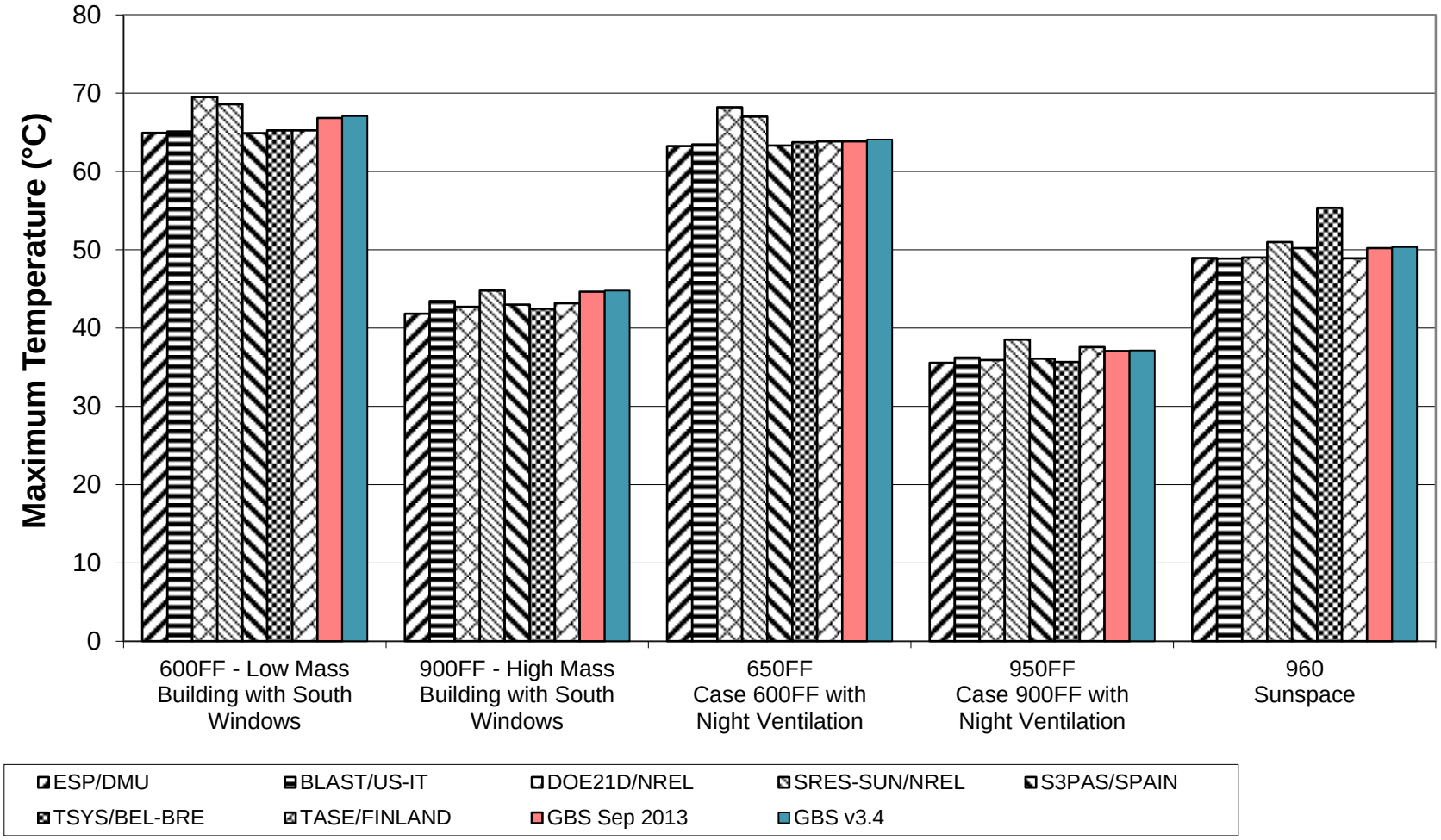


Figure B8-15. BESTEST BASIC Minimum Hourly Annual Temperature Free-Float Cases

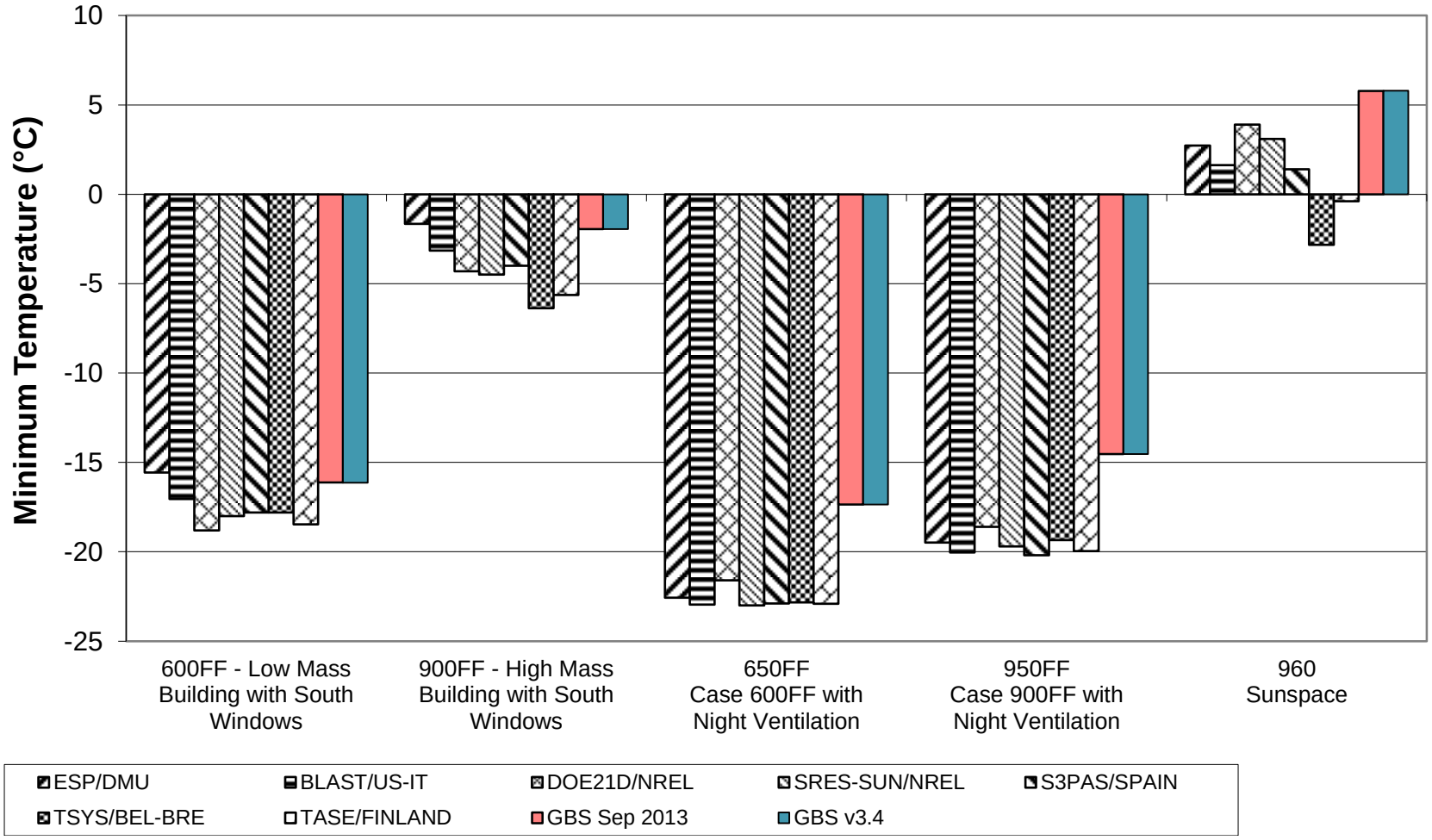


Figure B8-16. BESTEST BASIC Average Hourly Annual Temperature Free-Float Cases

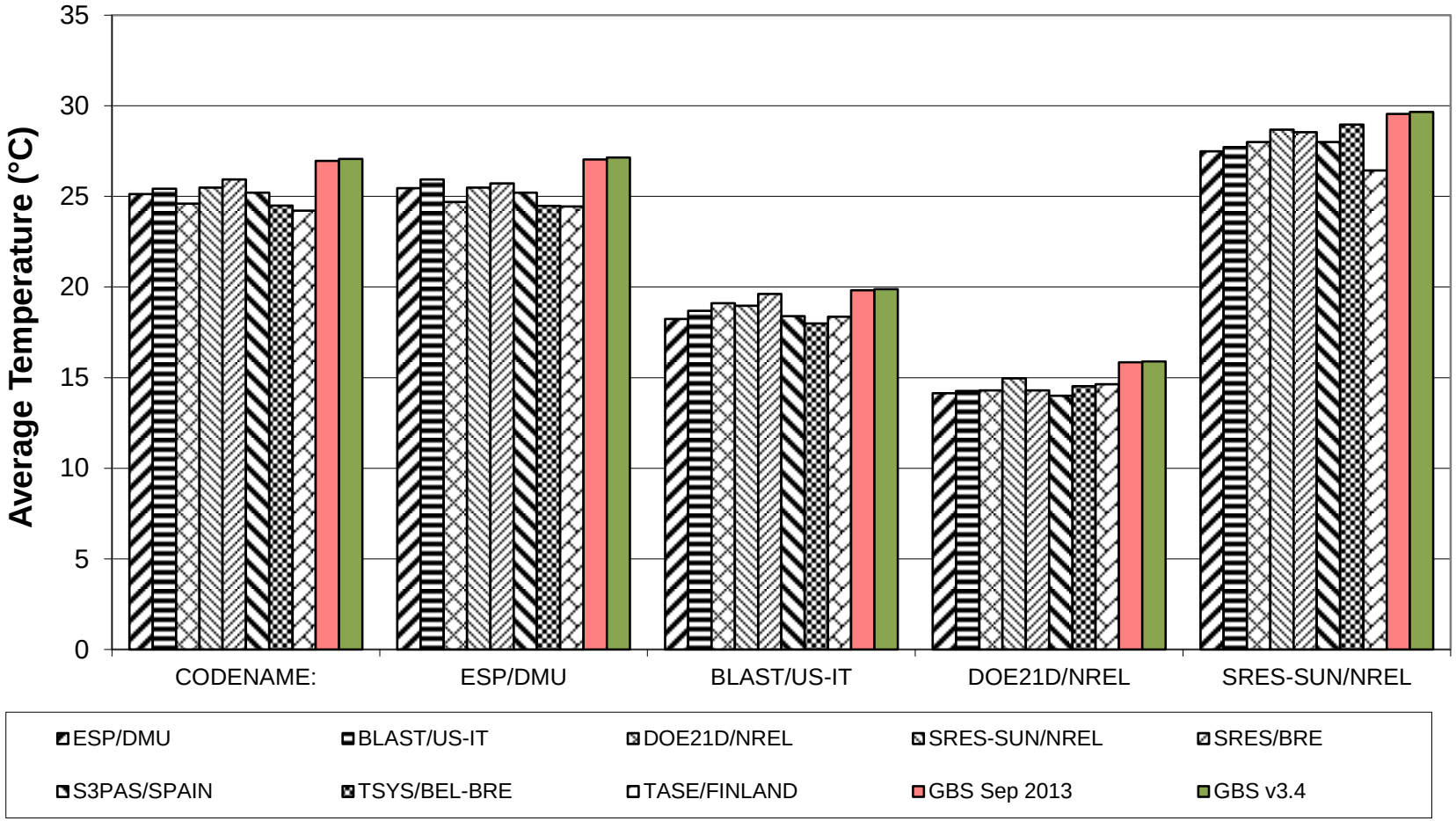


Figure B8-17. BESTEST BASIC South Window Shading (Delta) Annual Heating and Sensible Cooling

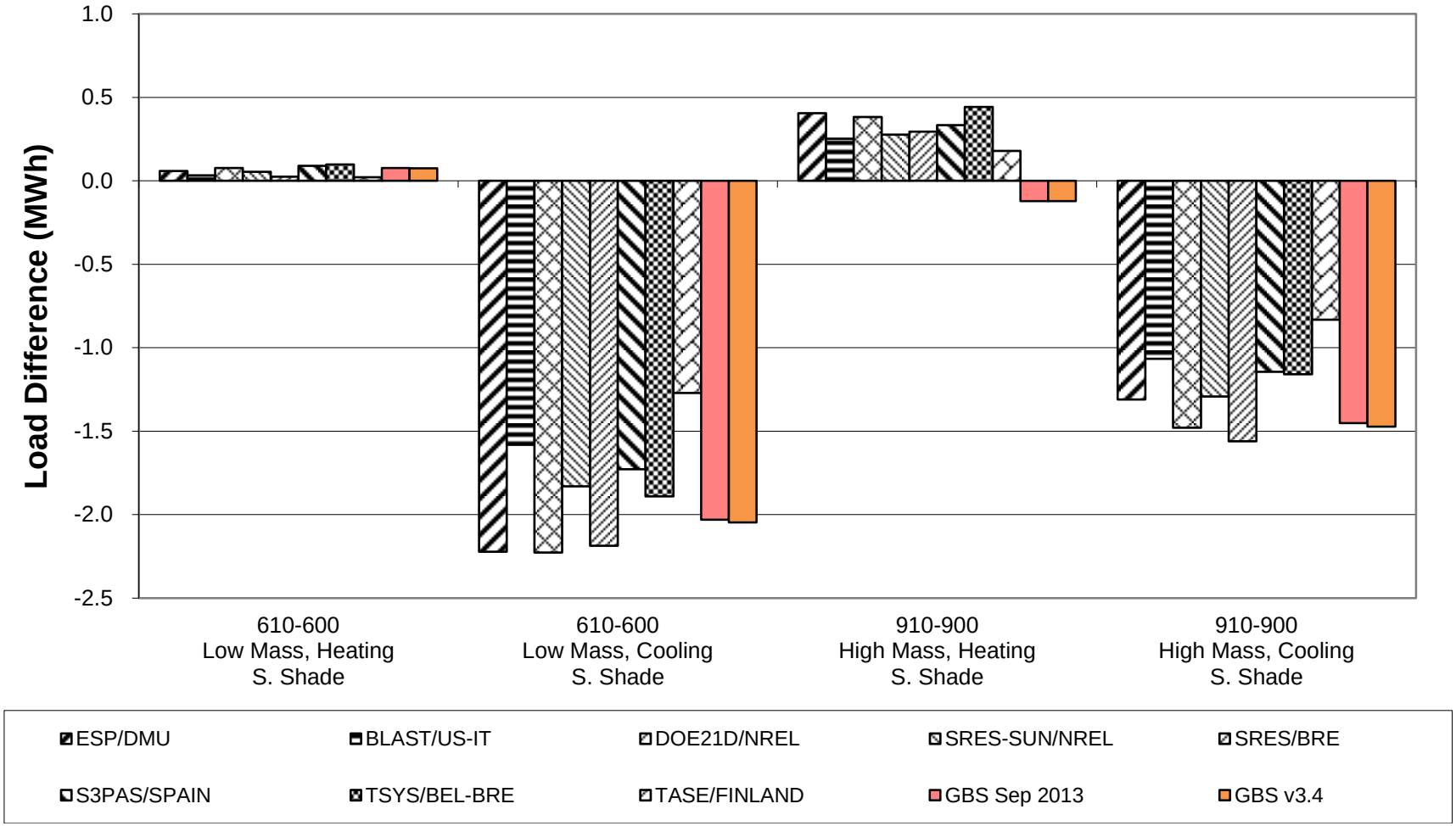


Figure B8-18. BESTEST BASIC South Window Shading (Delta) Peak Heating and Sensible Cooling

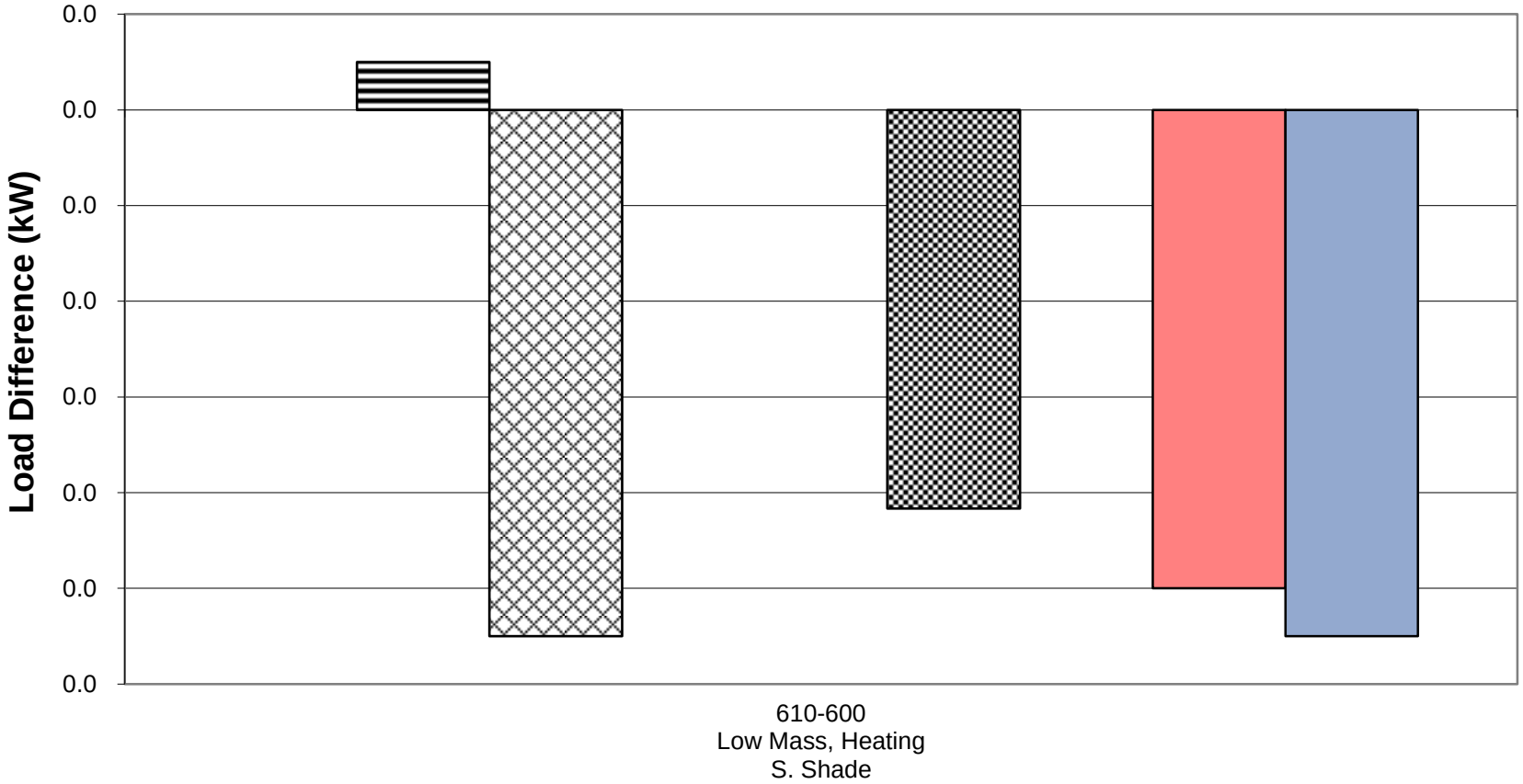


Figure B8-19. BESTEST BASIC East & West Window (Delta) Annual Heating and Sensible Cooling

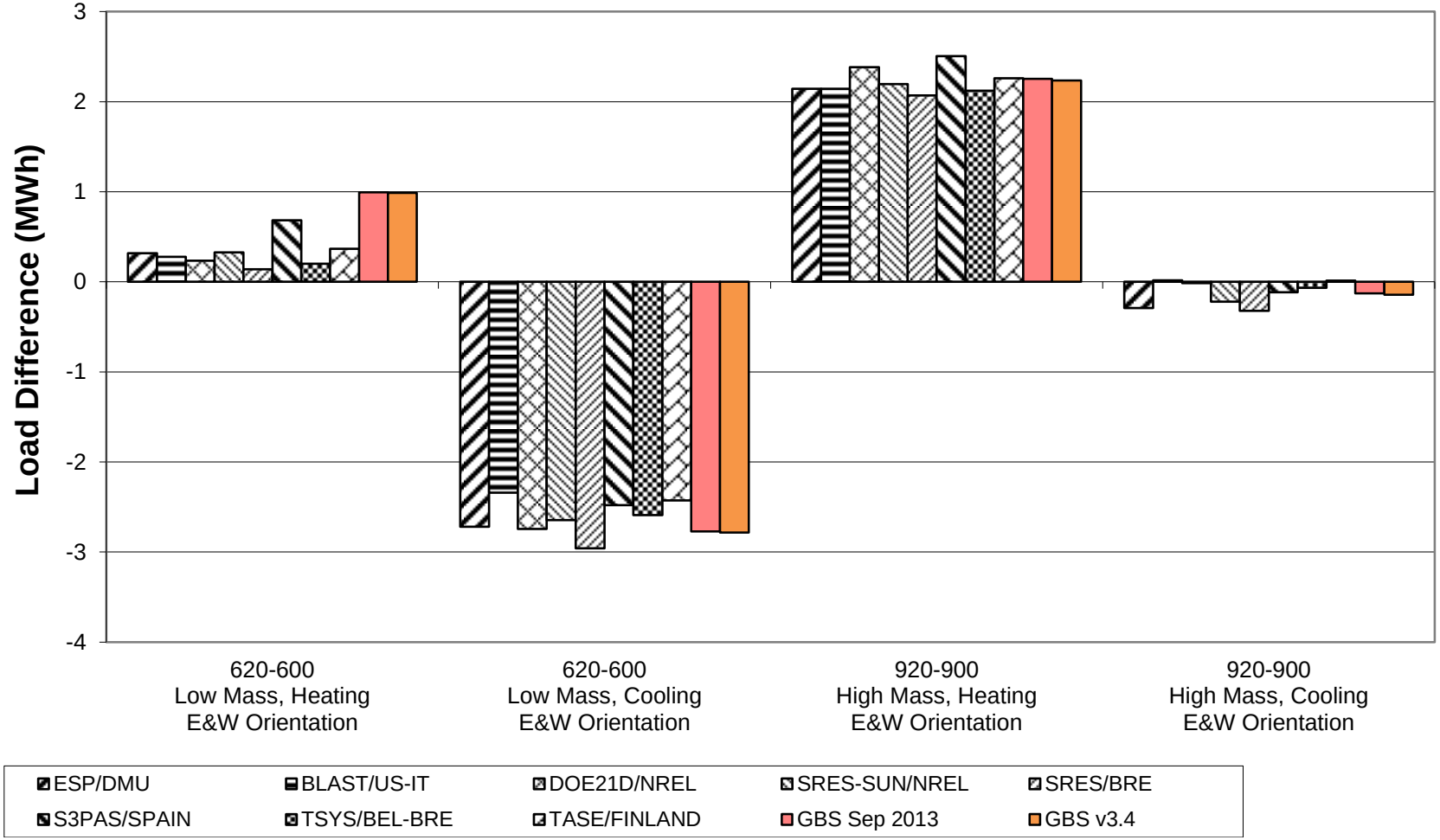


Figure B8-20. BESTEST BASIC East & West Window (Delta) Peak Heating and Sensible Cooling

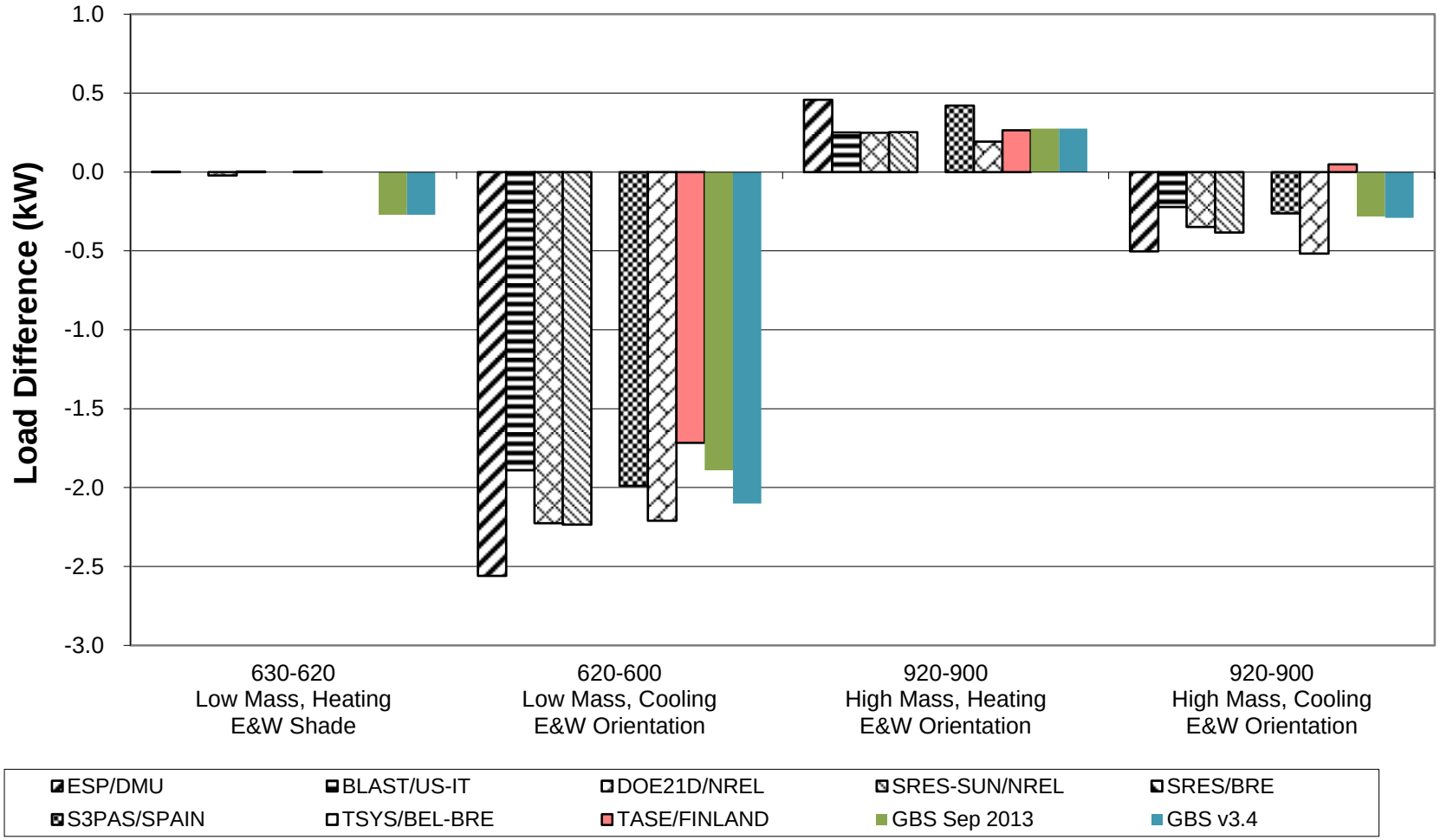


Figure B8-21. BESTEST BASIC East & West Shaded Window (Delta) Annual Heating and Sensible Cooling

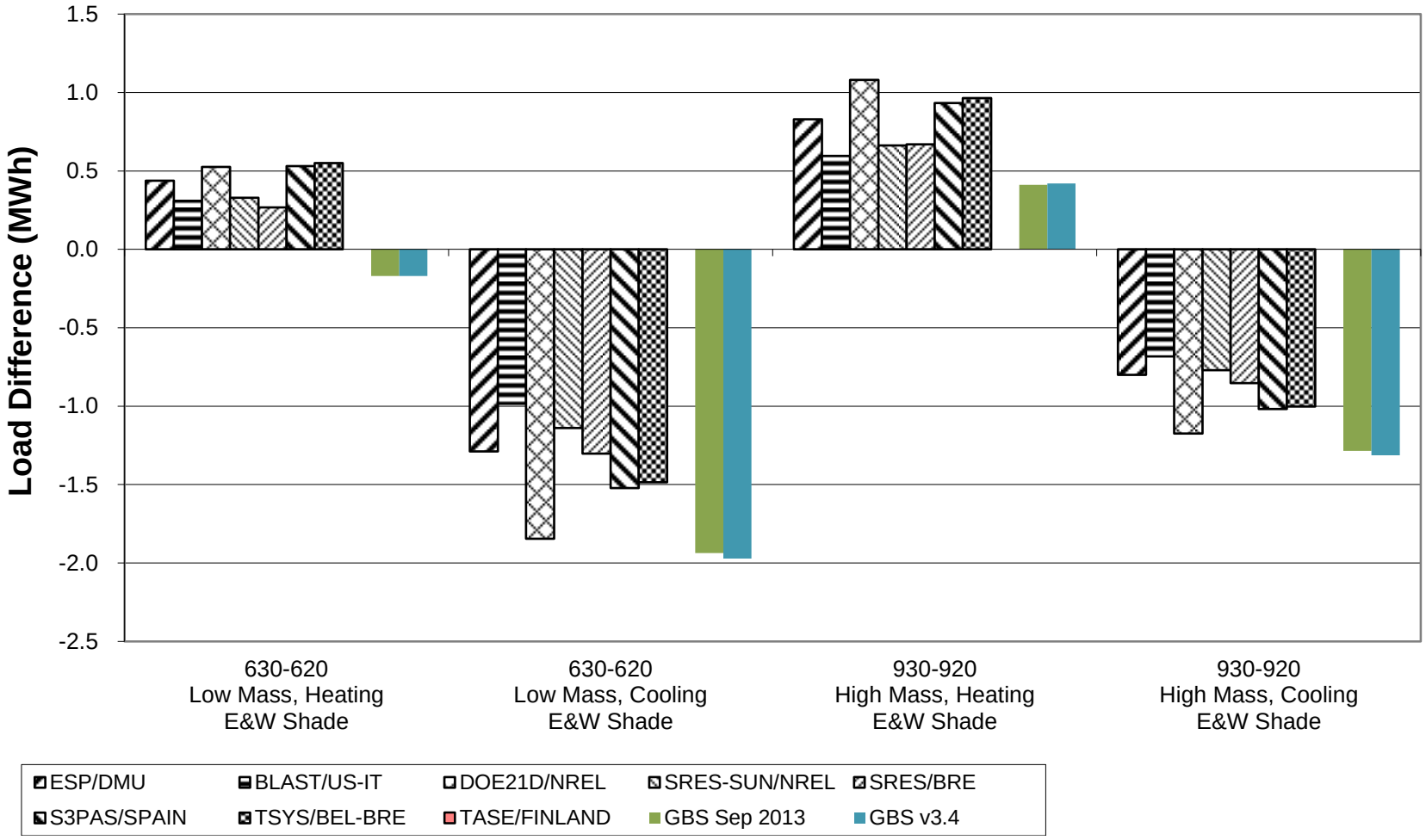


Figure B8-22. BESTEST BASIC East & West Shaded Window (Delta) Peak Heating and Sensible Cooling

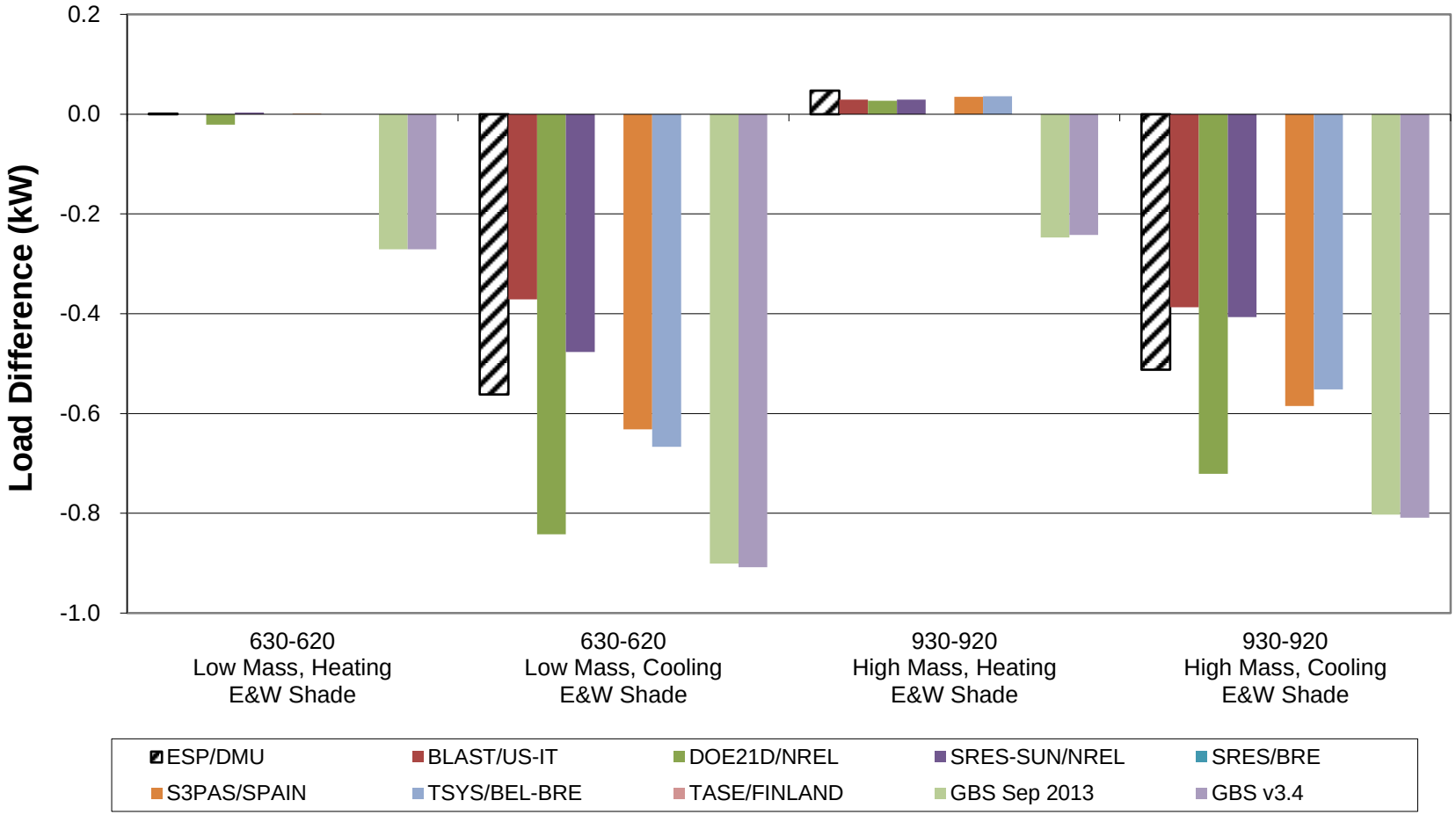


Figure B8-23. BESTEST BASIC Thermostat Setback (Delta) Annual Heating

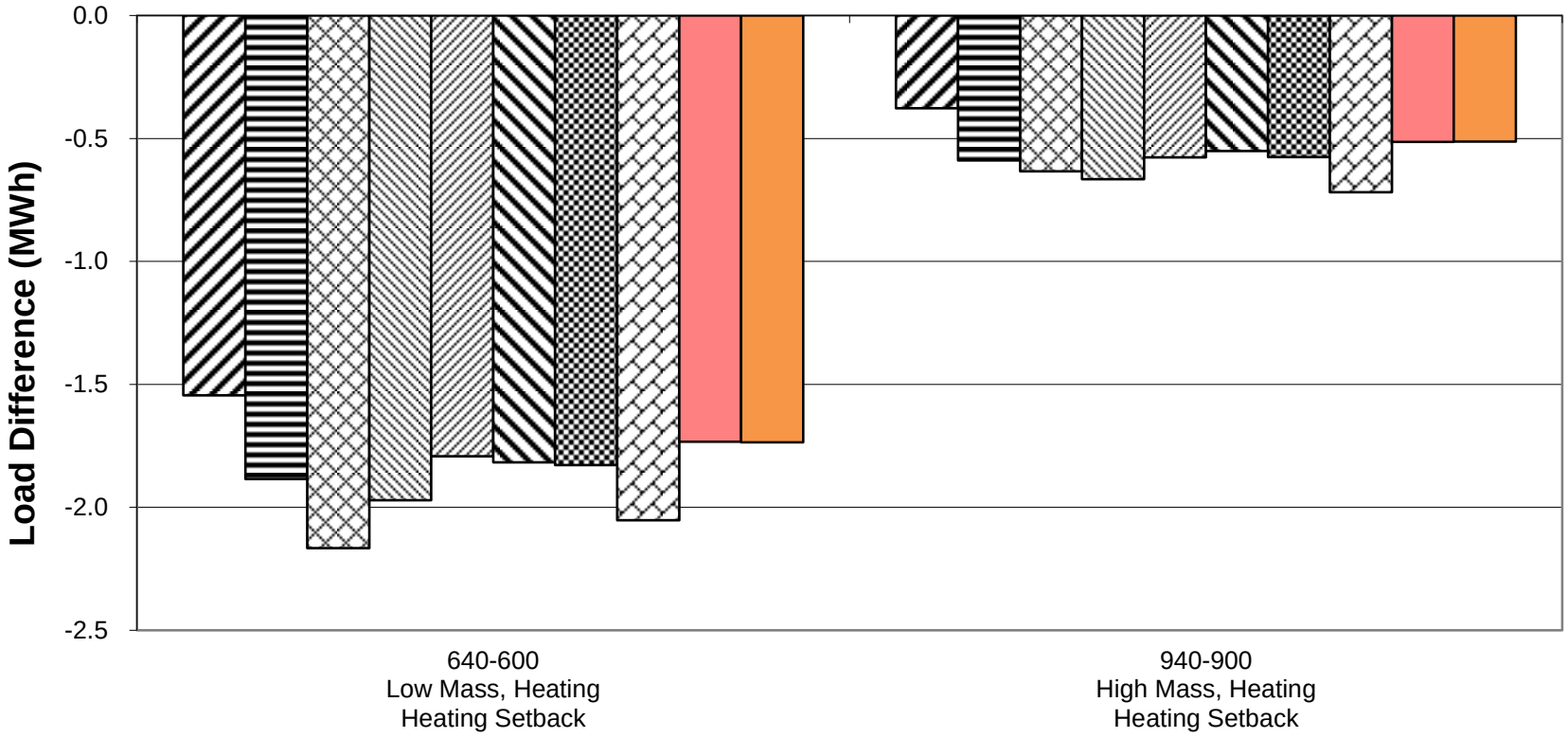


Figure B8-24. BESTEST BASIC Thermostat Setback (Delta) Peak Heating

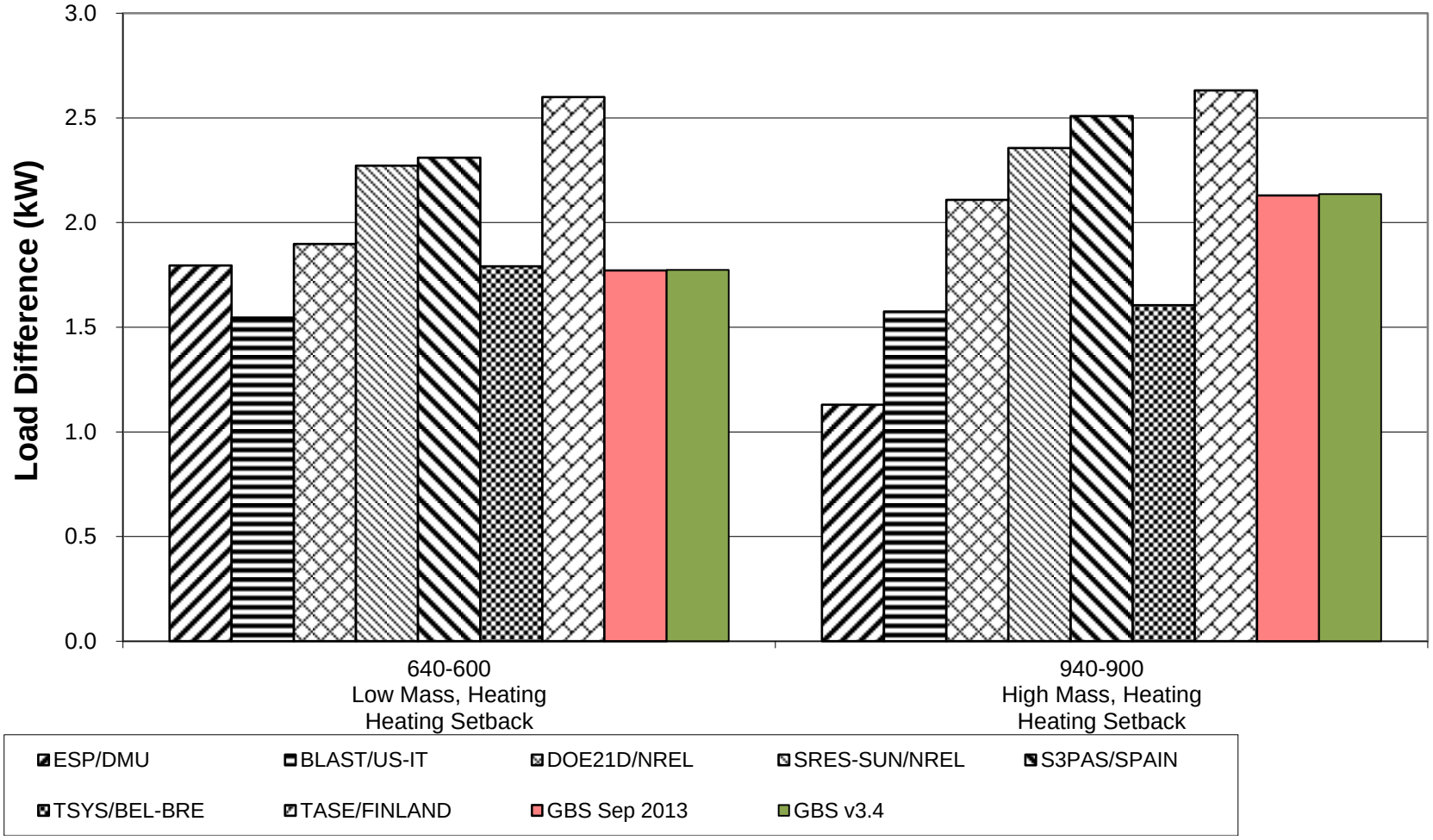


Figure B8-25. BESTEST BASIC Vent Cooling (Delta) Annual Sensible Cooling

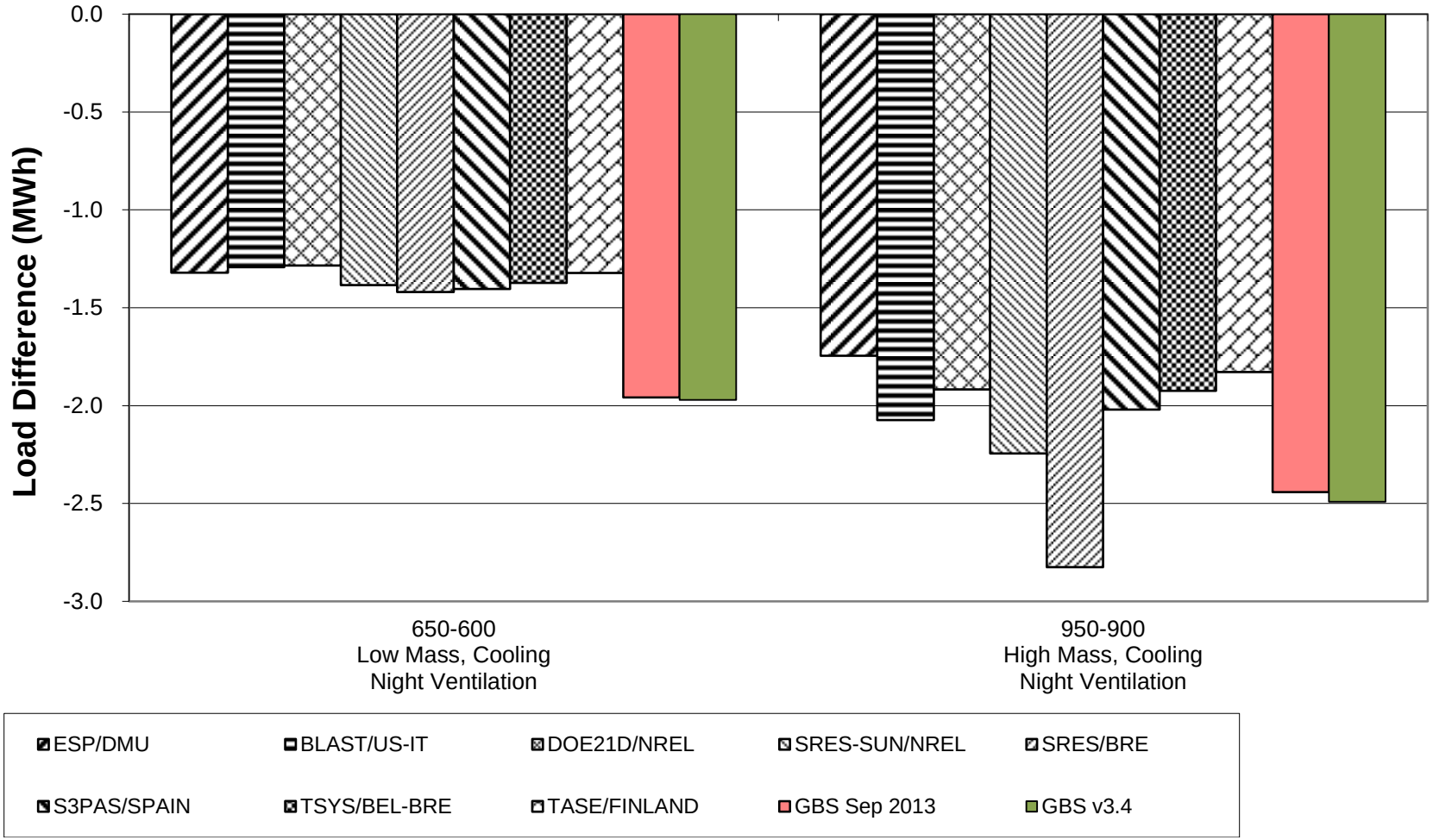


Figure B8-26. BESTEST BASIC
Vent Cooling (Delta)
Peak Sensible Cooling

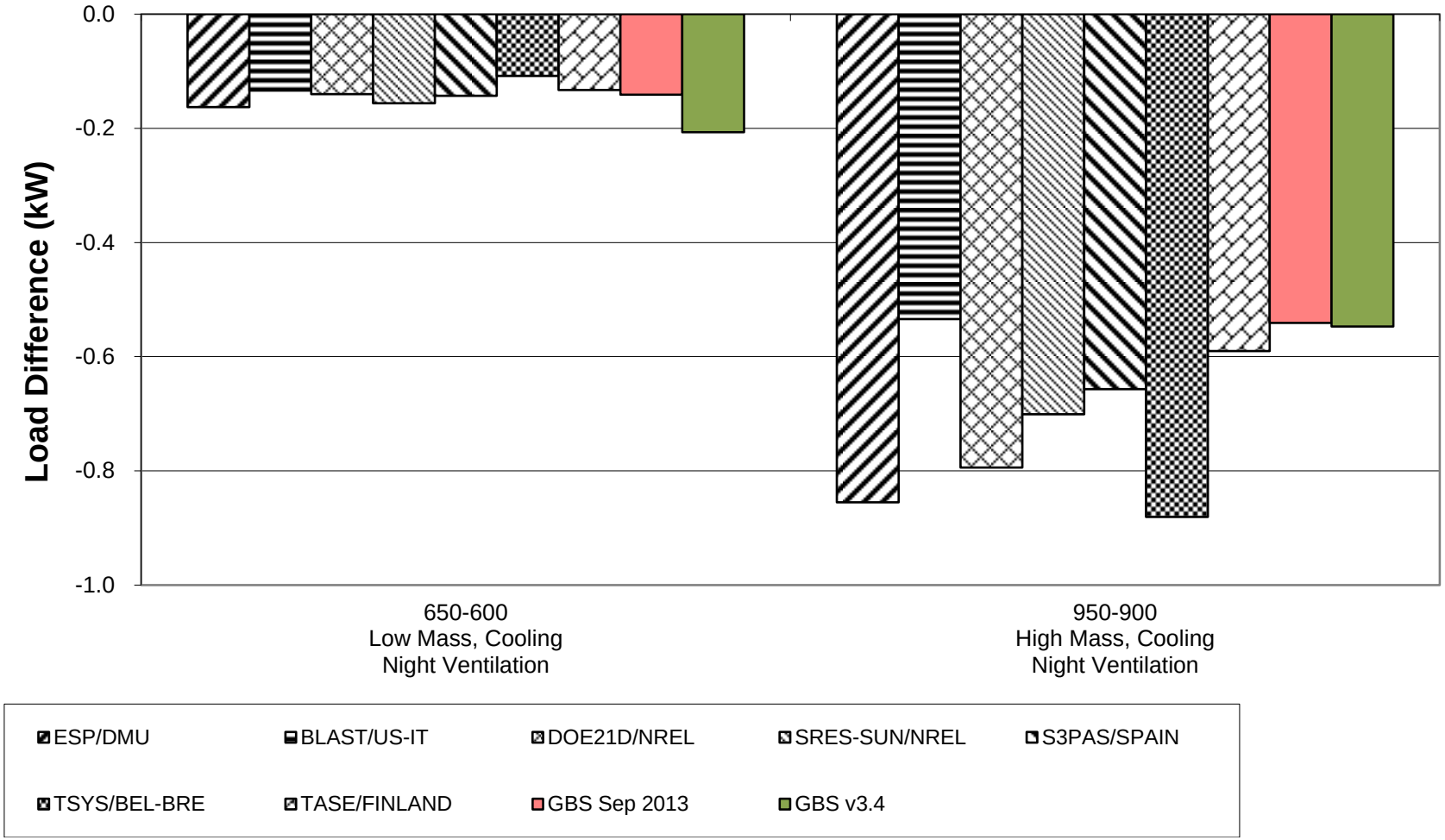


Figure B8-27. BESTEST BASIC Sunspace (Delta) Annual Heating and Sensible Cooling

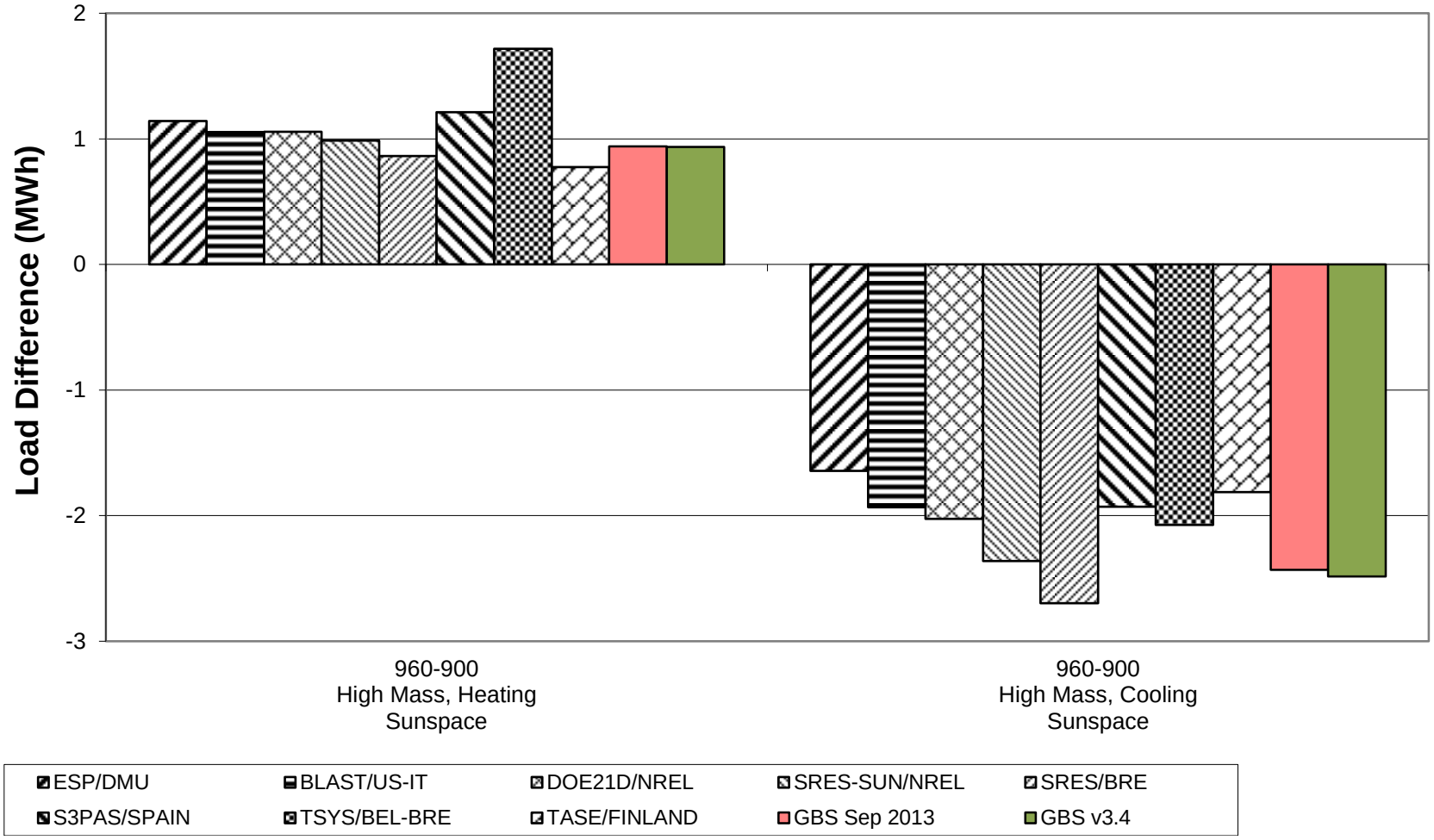


Figure B8-28. BESTEST BASIC Sunspace (Delta) Peak Heating and Sensible Cooling

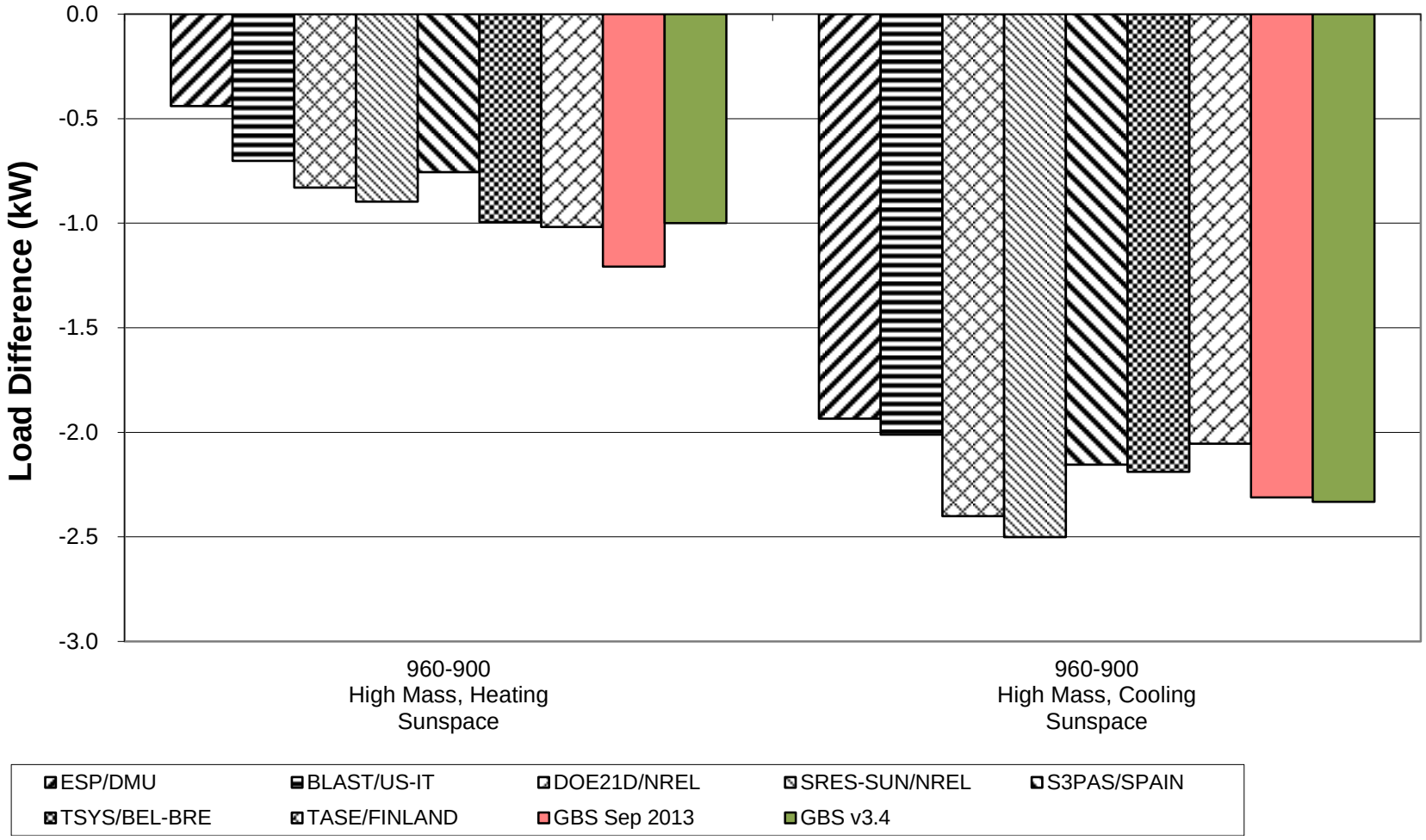


Figure B8-29. BESTEST BASIC AND IN-DEPTH
Mass Effect (Delta)
Annual Heating and Sensible Cooling

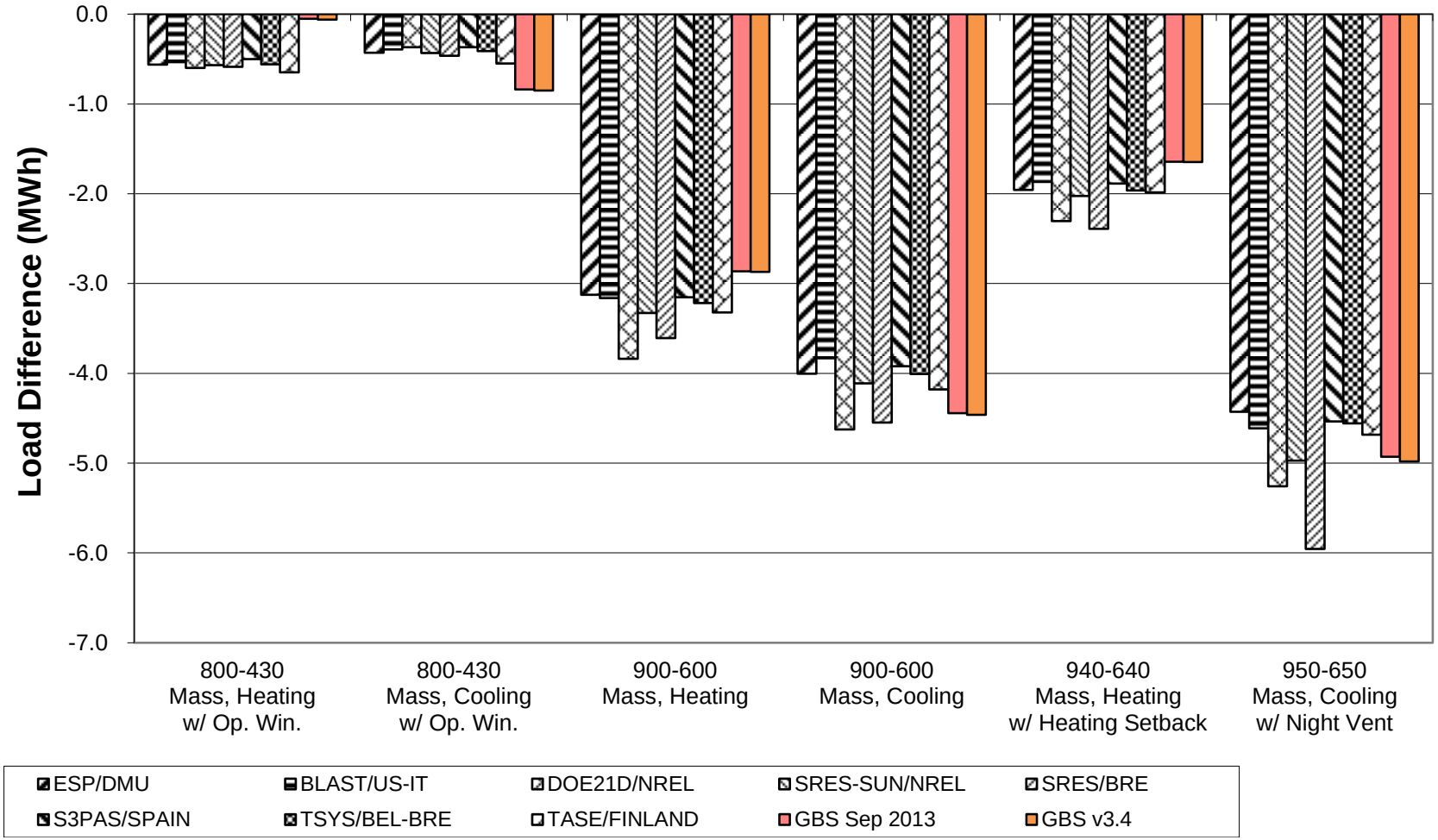


Figure B8-30. BESTEST BASIC AND IN-DEPTH
Mass Effect (Delta)
Peak Heating and Sensible Cooling

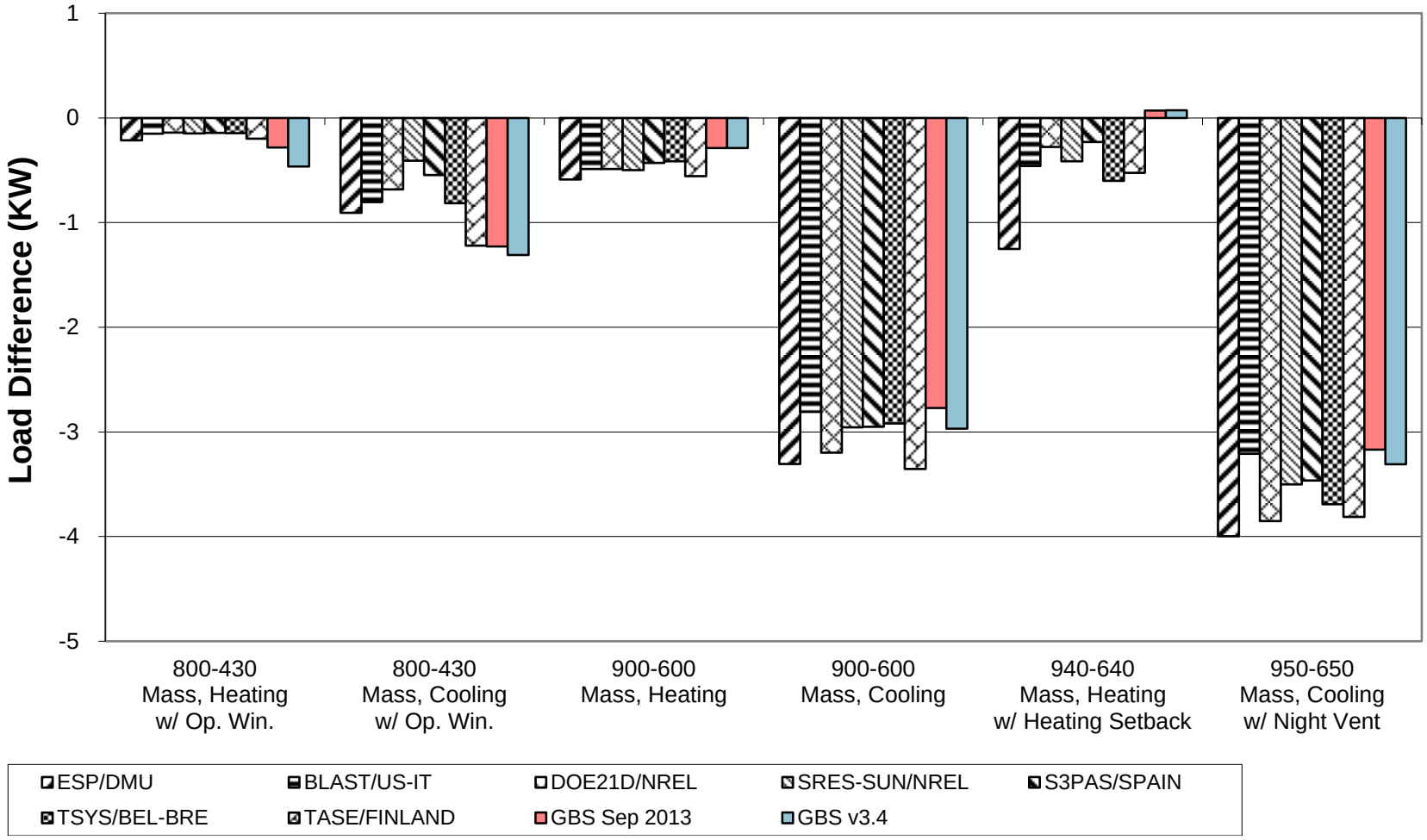


Figure B8-31. BESTEST IN-DEPTH South Window (Delta) Annual Heating and Sensible Cooling

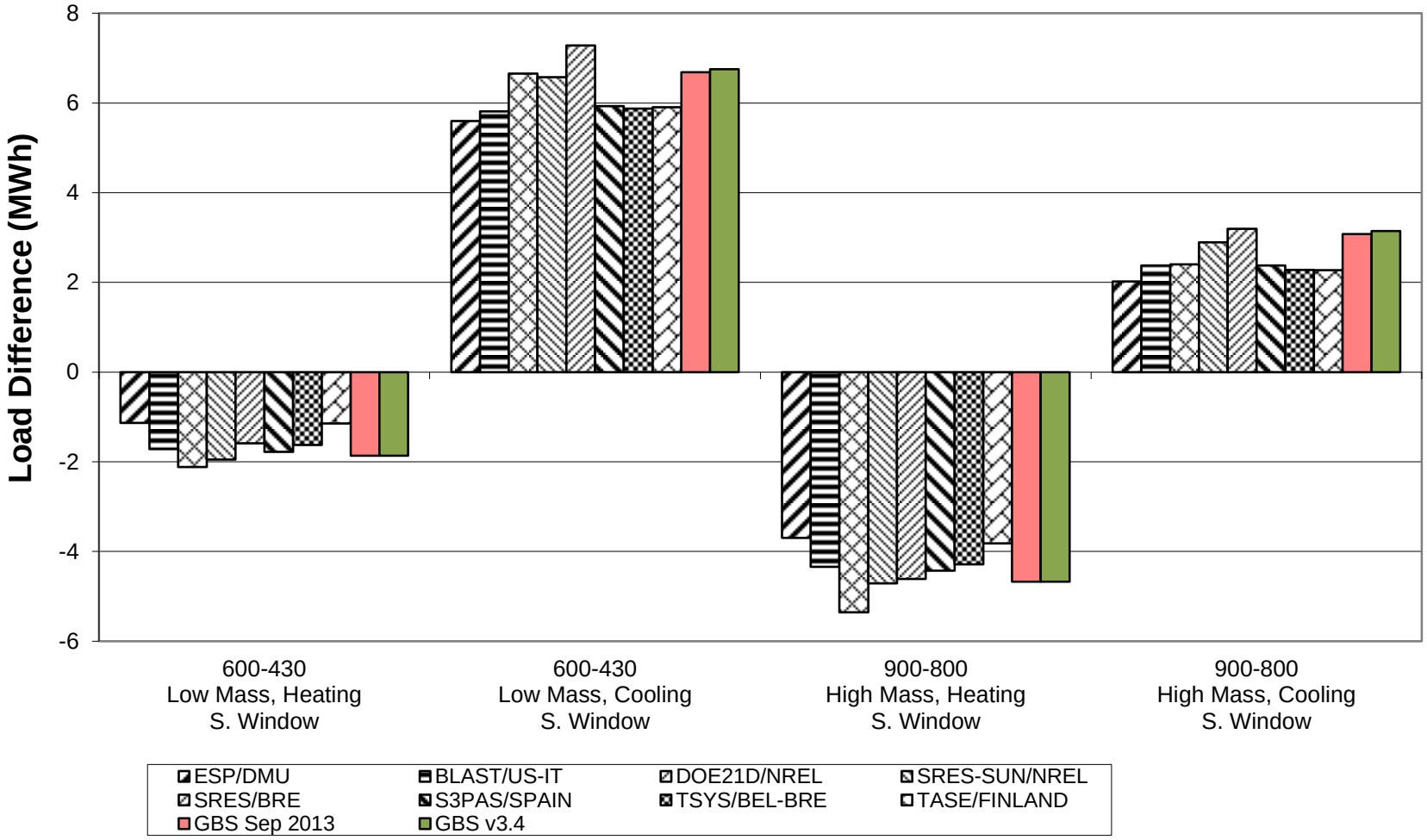


Figure B8-32. BESTEST IN-DEPTH South Window (Delta) Peak Heating and Sensible Cooling

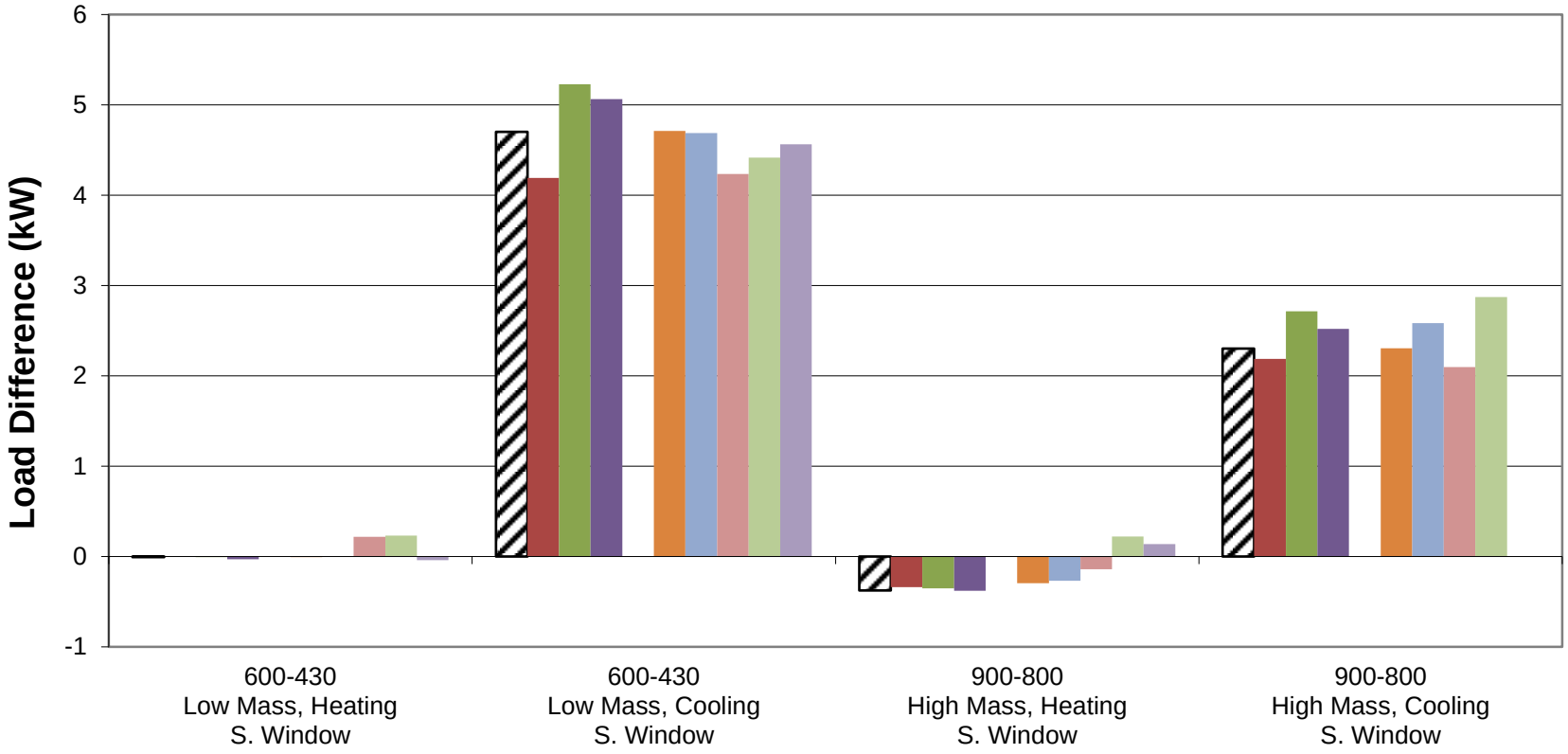


Figure B8-33. BESTEST IN-DEPTH
Low Mass Annual Heating
Cases 195 to 250

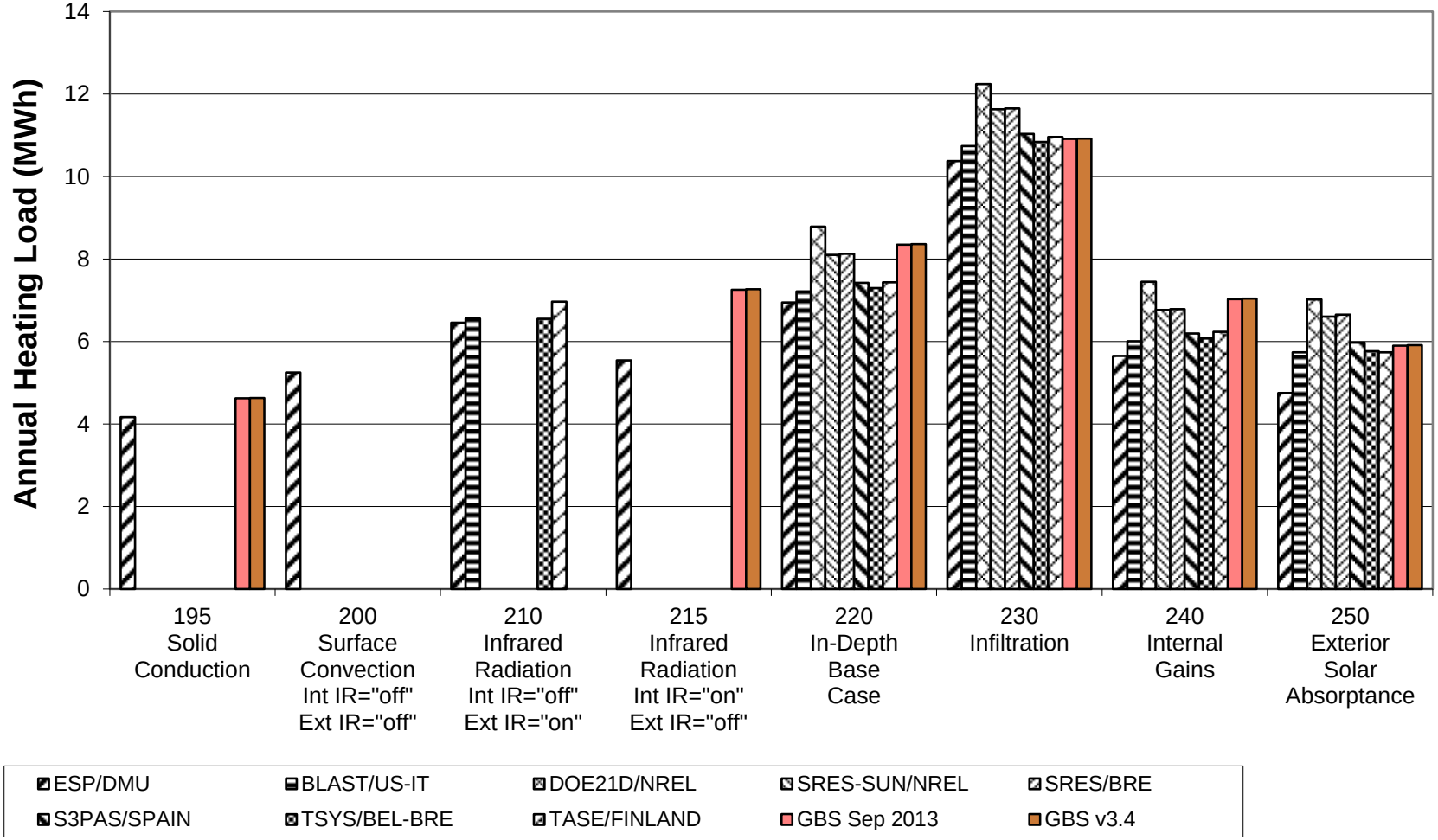


Figure B8-34. BESTEST IN-DEPTH Low Mass Annual Sensible Cooling Cases 195 to 250

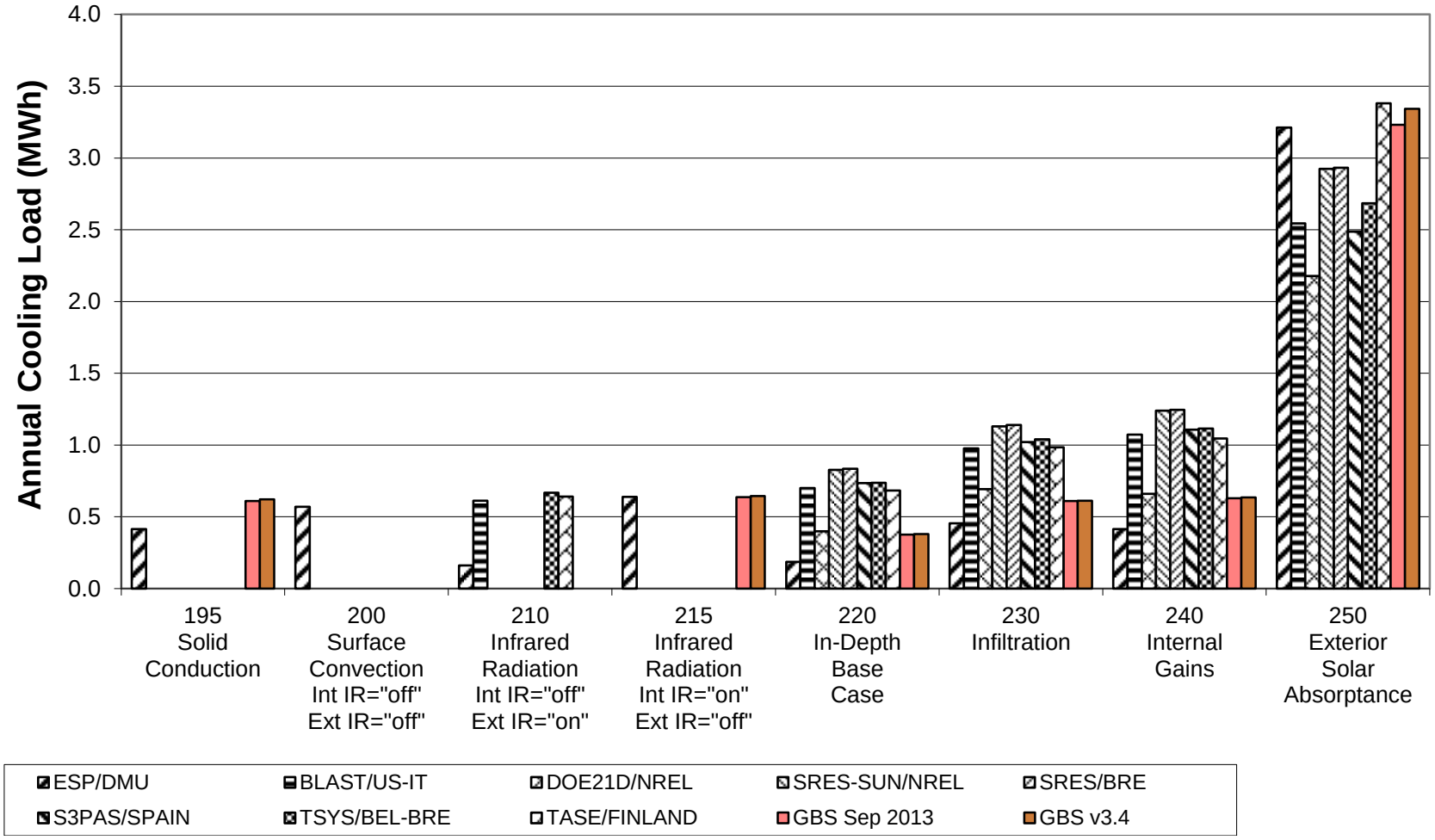


Figure B8-35. BESTEST IN-DEPTH
Low Mass Peak Heating
Cases 195 to 250

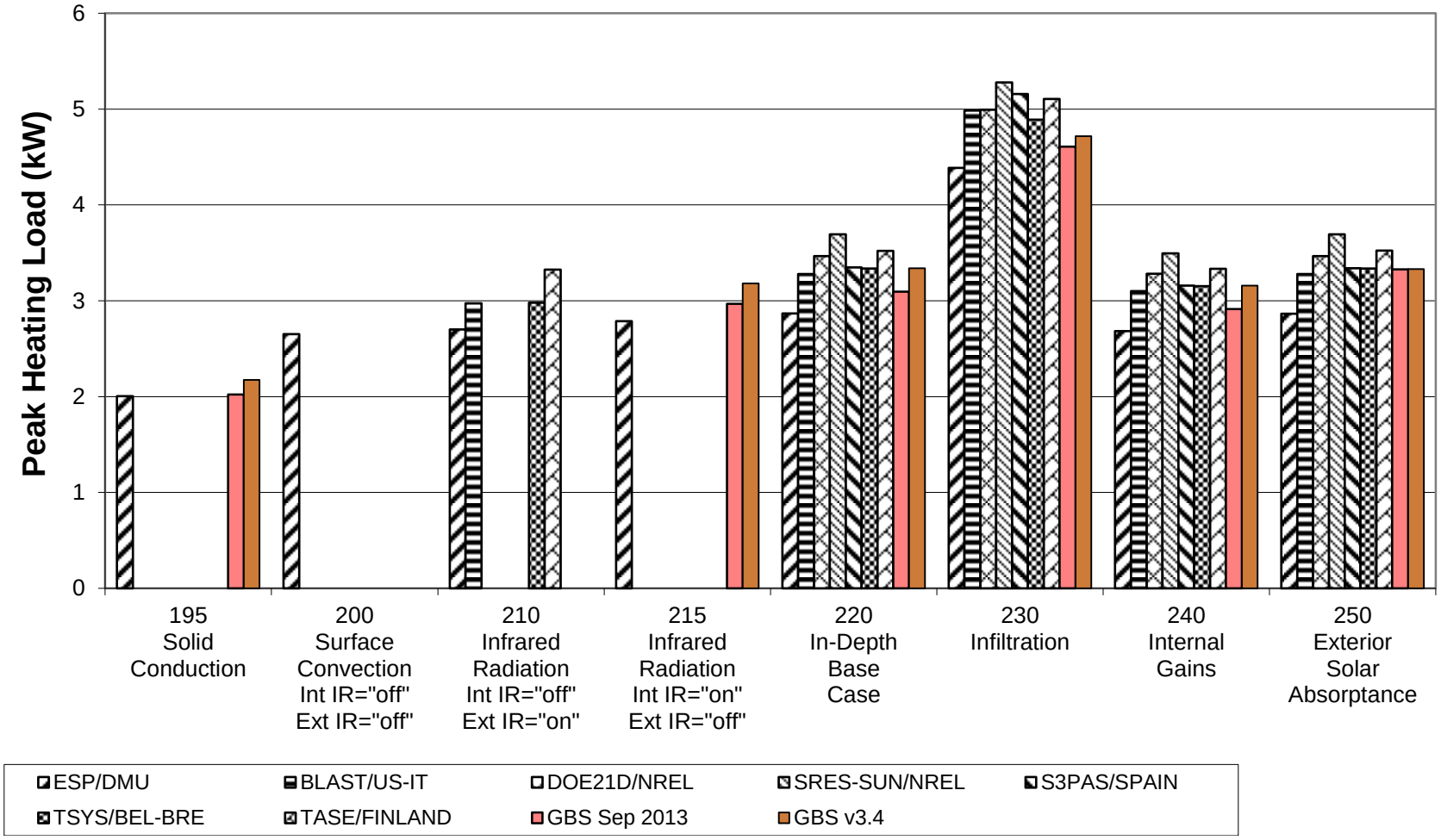


Figure B8-36. BESTEST IN-DEPTH Low Mass Peak Sensible Cooling Cases 195 to 250

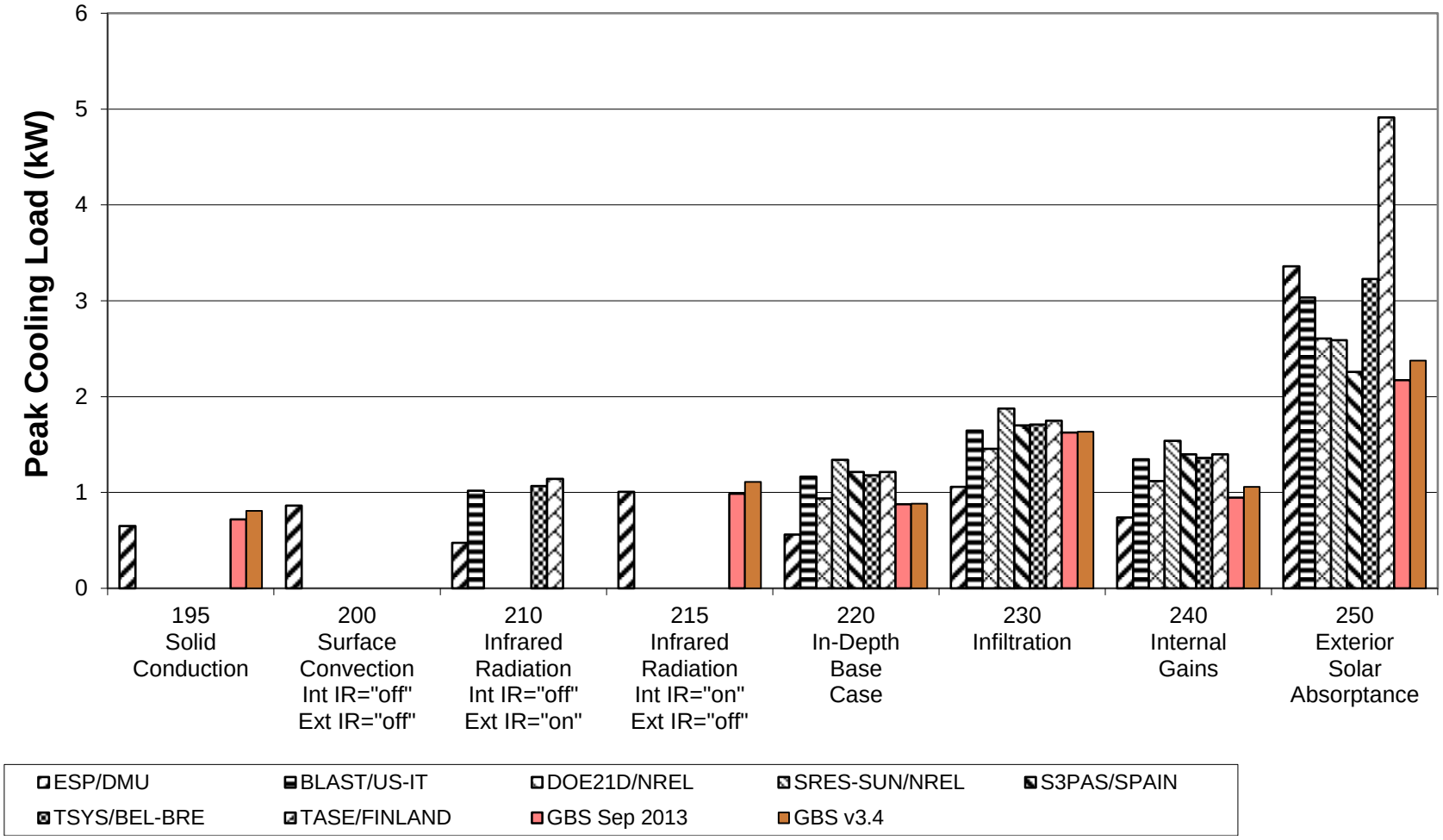
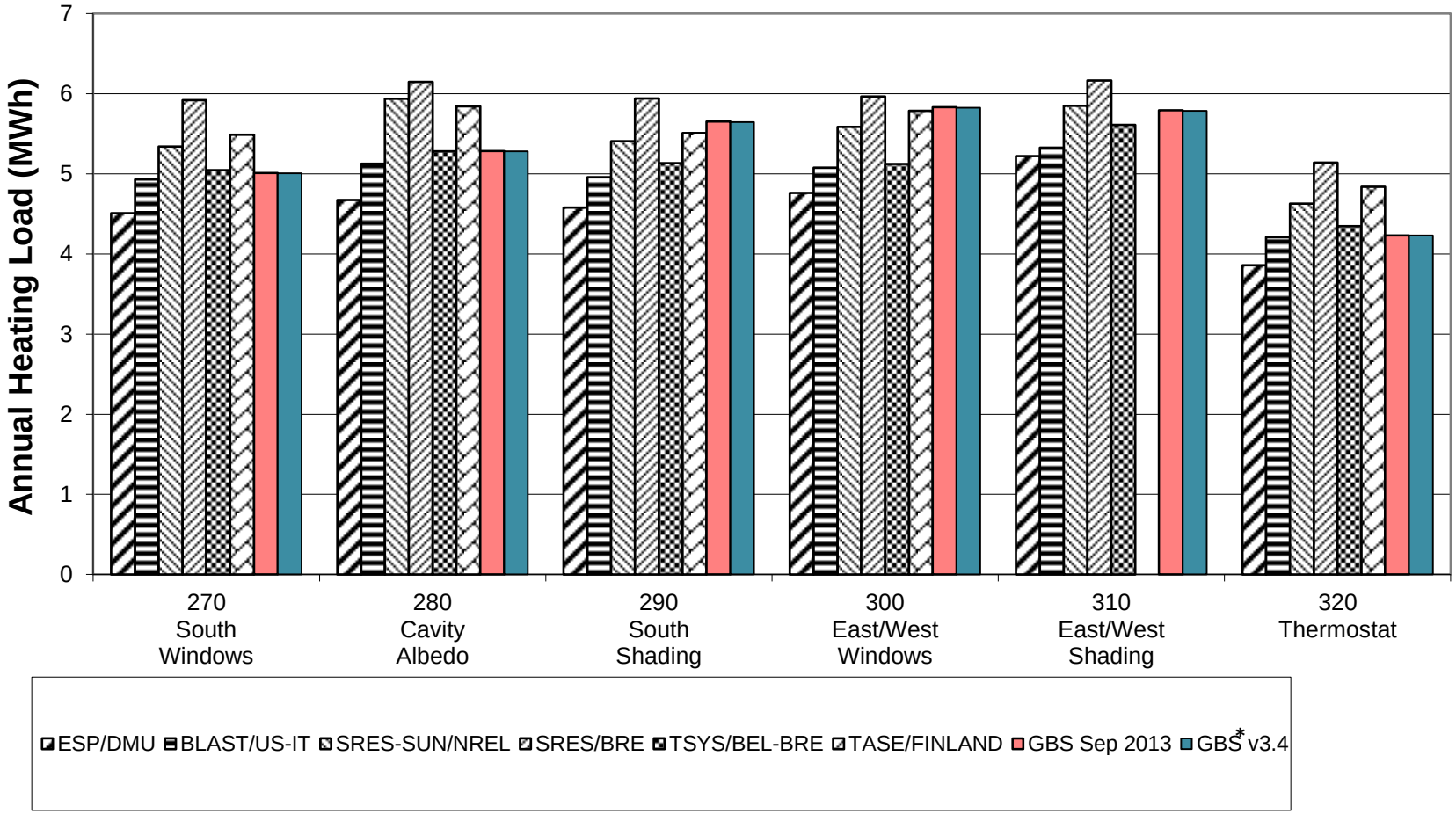
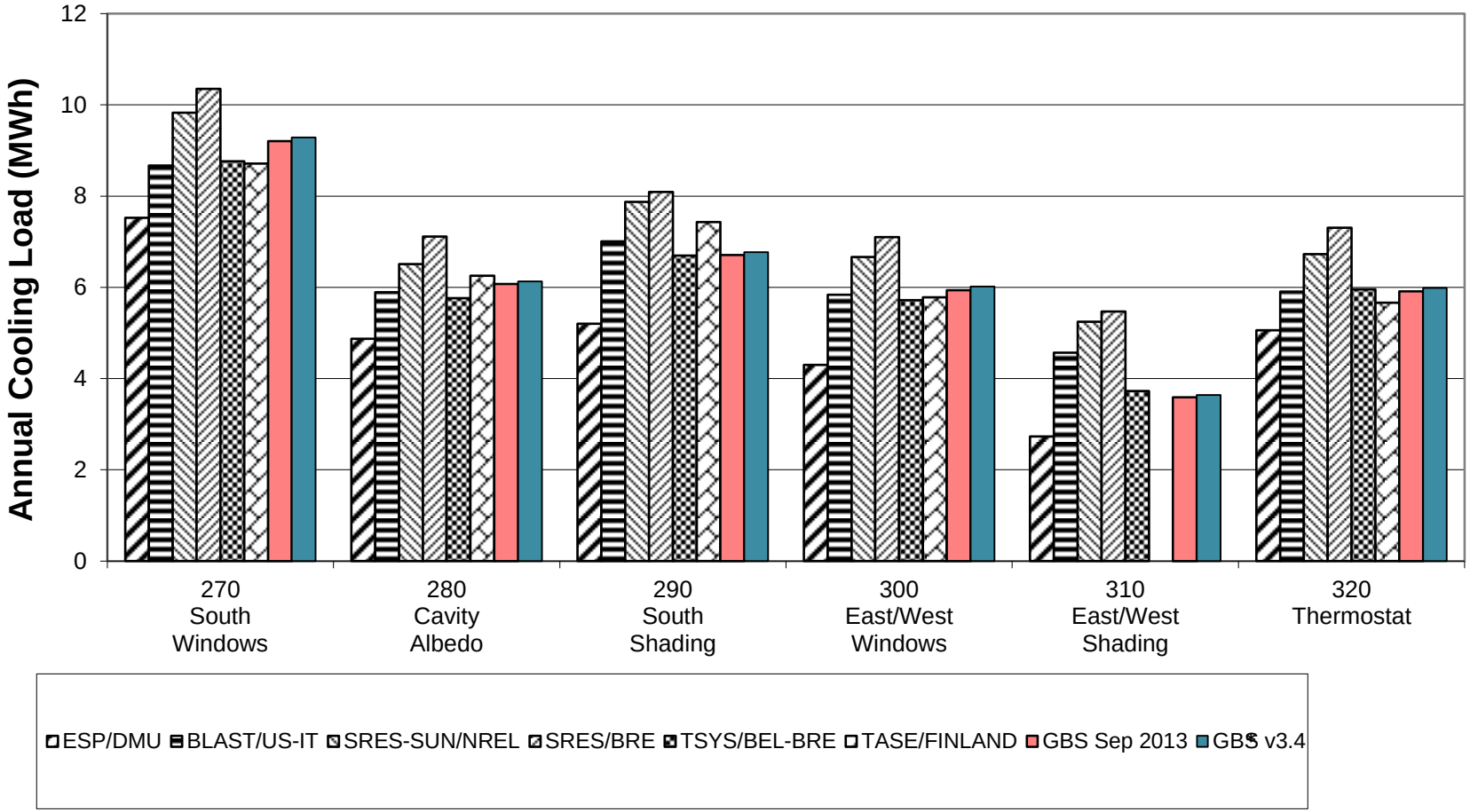


Figure B8-37. BESTEST IN-DEPTH
Low Mass Annual Heating
Cases 270 to 320



* SRES/BRE Cases 270, 290-320 have input error likely affecting results by <0.2 MWh/y (<3%)

Figure B8-38. BESTEST IN-DEPTH Low Mass Annual Sensible Cooling Cases 270 to 320



* SRES/BRE Cases 270, 290-320 have input error likely affecting results by <0.2 MWh/y (<3%)

Figure B8-39. BESTEST IN-DEPTH
Low Mass Peak Heating
Cases 270 to 320

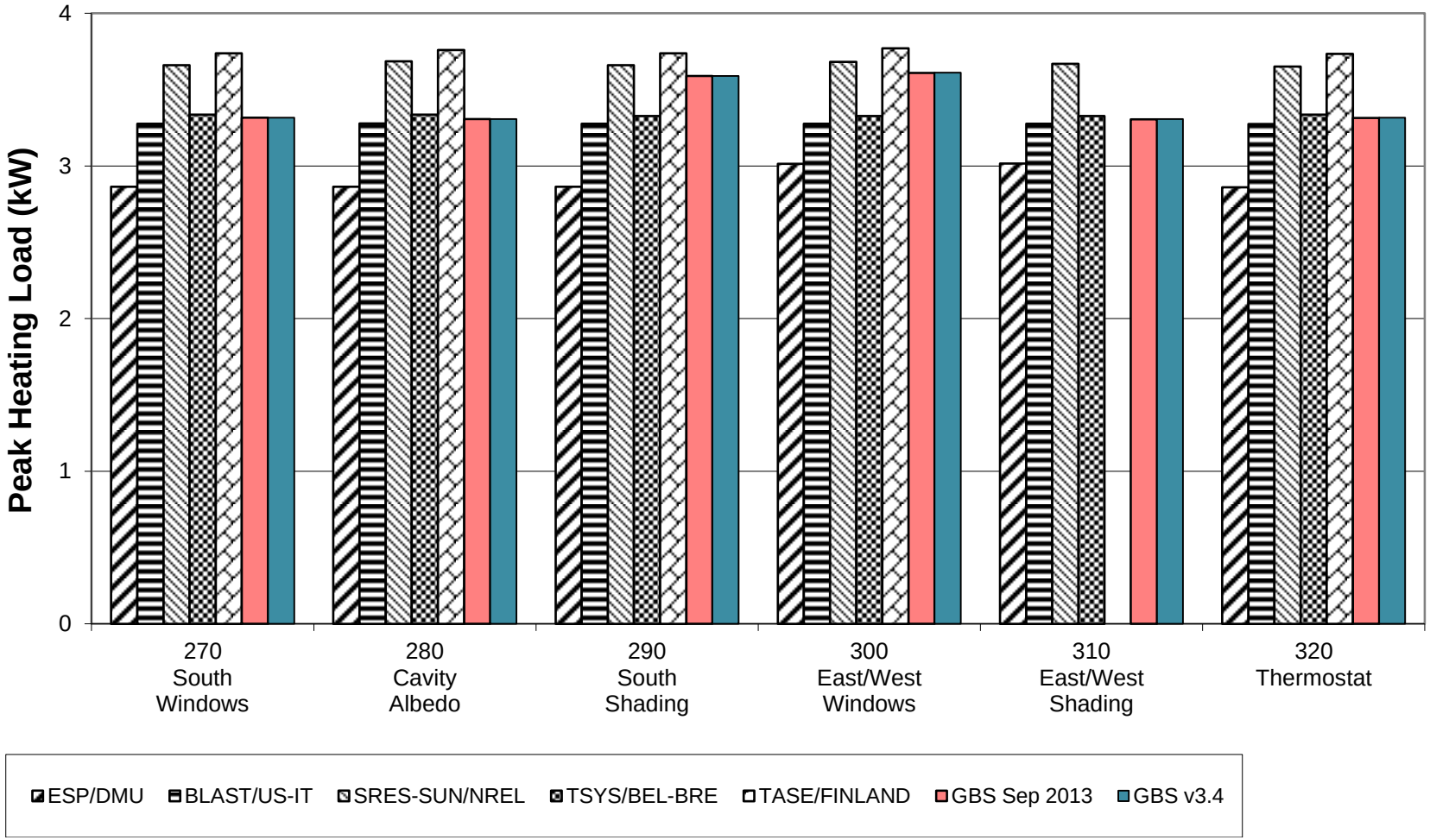


Figure B8-40. BESTEST IN-DEPTH Low Mass Peak Sensible Cooling Cases 270 to 320

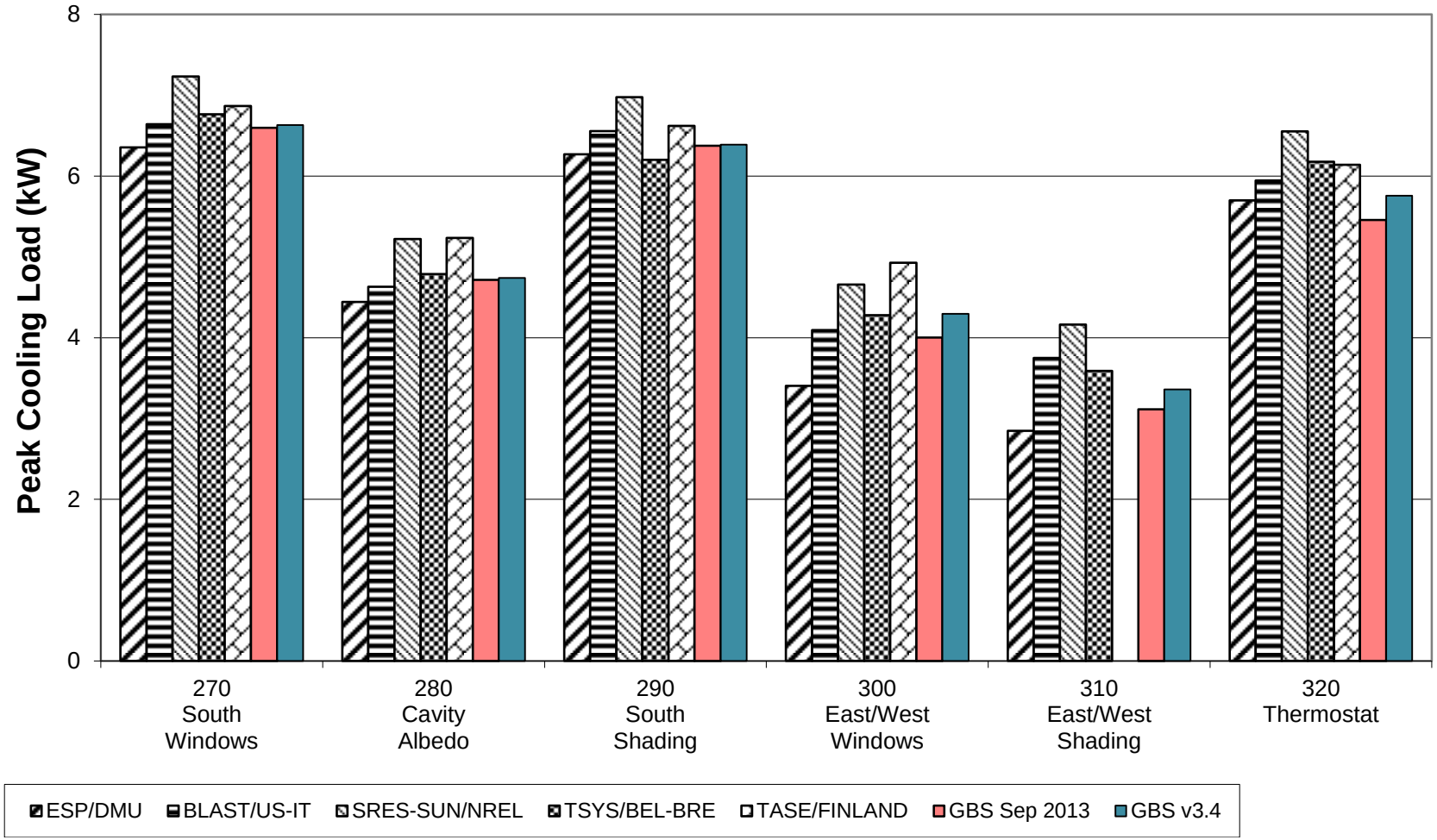


Figure B8-41. BESTEST IN-DEPTH Cases 195 to 220 (Delta) Annual Heating and Sensible Cooling

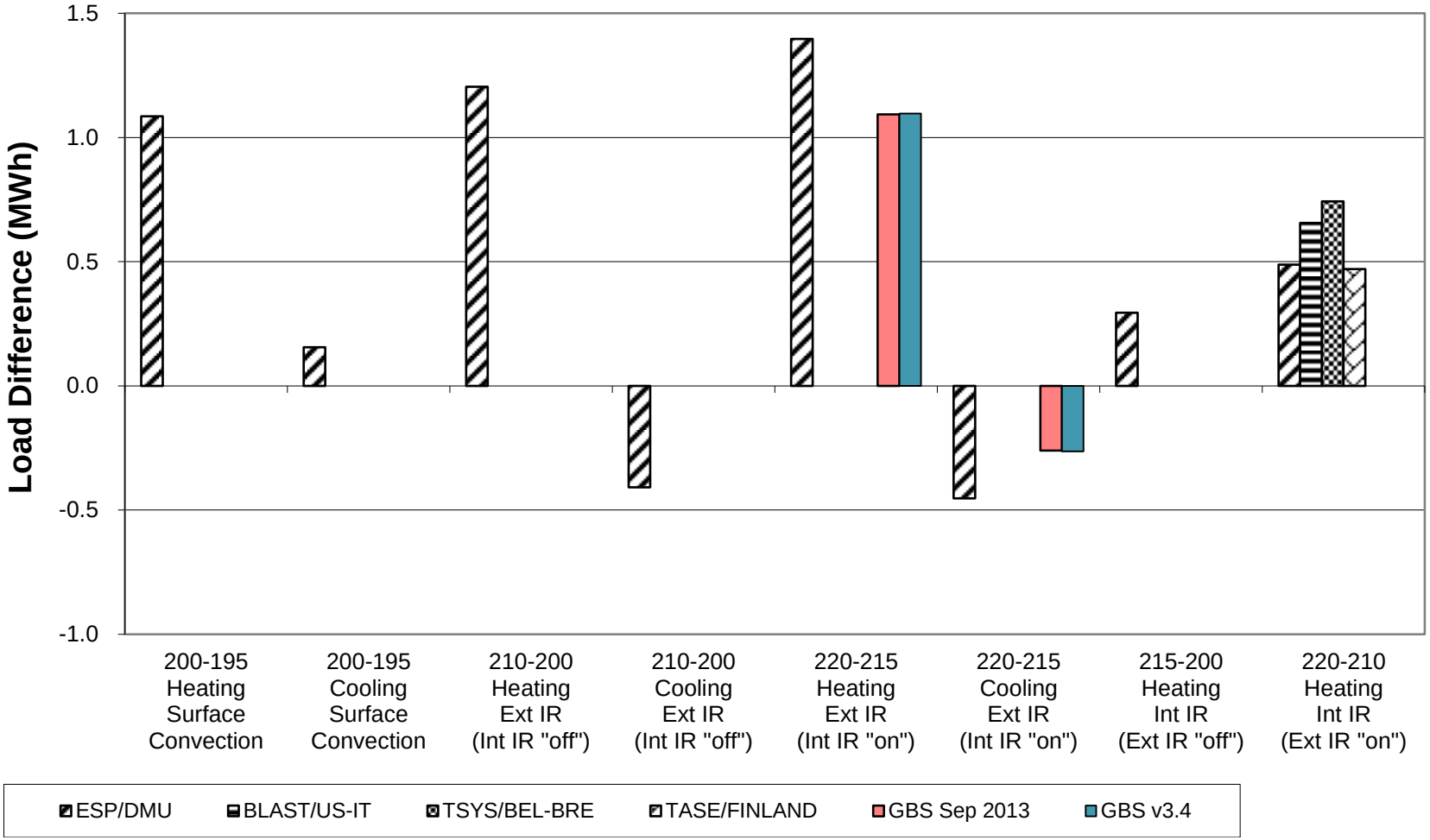


Figure B8-42. BESTEST IN-DEPTH Cases 195 to 220 (Delta) Peak Heating and Sensible Cooling

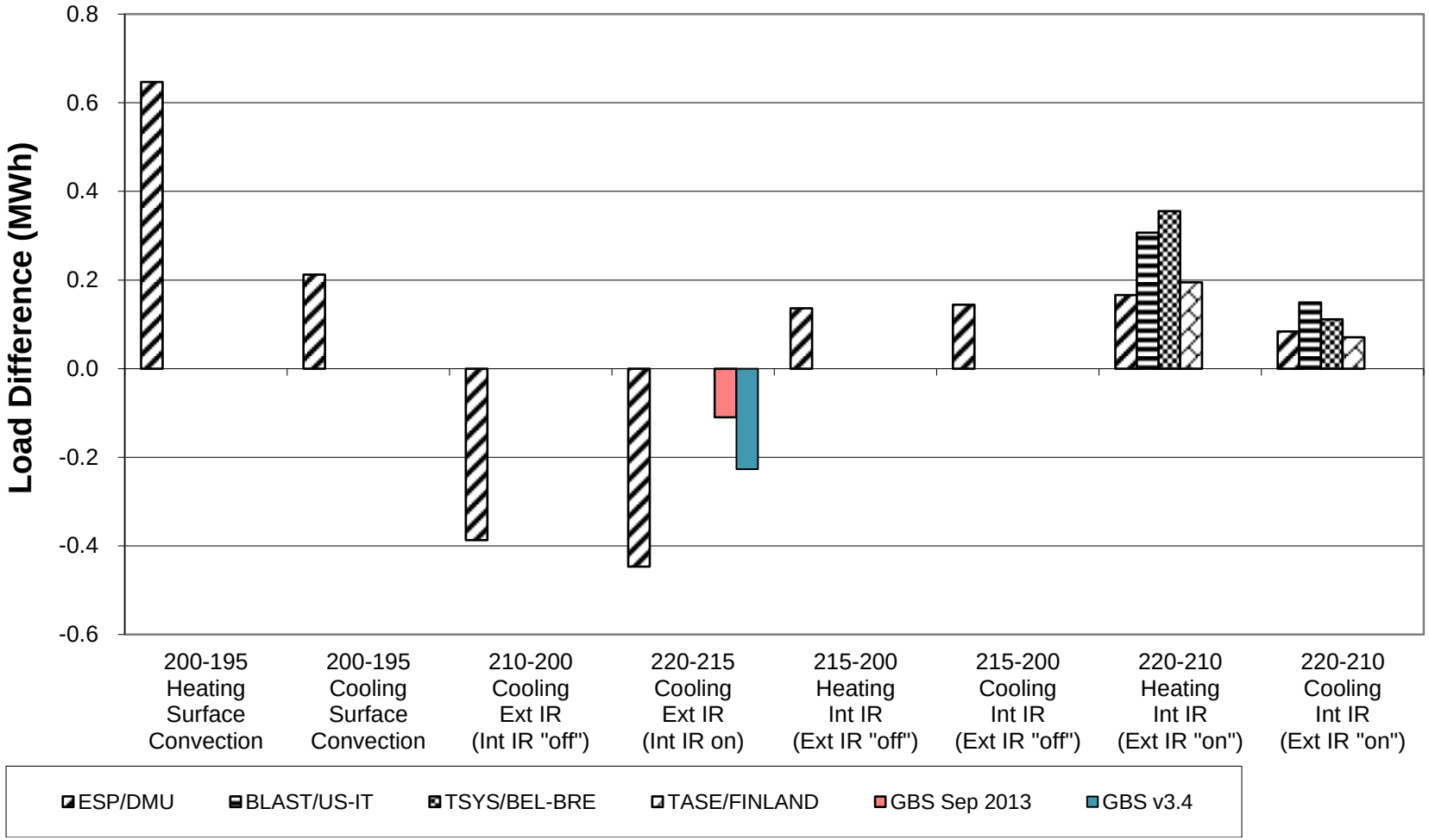
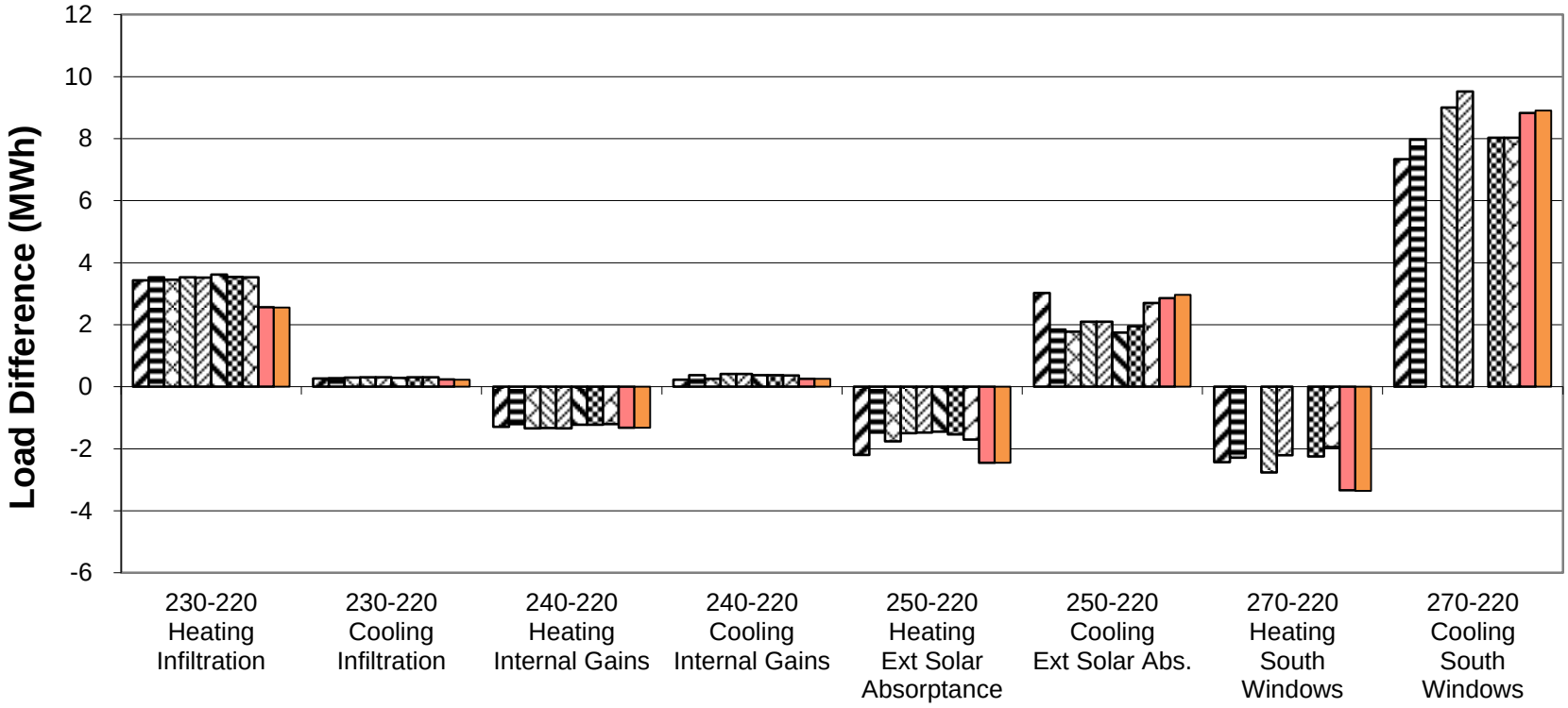


Figure B8-43. BESTEST IN-DEPTH
Cases 220 to 270 (Delta)
Annual Heating and Sensible Cooling



ESP/DMU | BLAST/US-IT | DOE21D/NREL | SRES-SUN/NREL | SRES/BRE | S3PAS/SPAIN | TSYS/BEL-BRE | TASE/FINLAND | GBS Sep 2013 | GBS v3.4 *

* SRES/BRE Case 270 has input error likely affecting 270-220 sensitivity results for heating by <0.2 MWh/y (<6%), and for cooling by <0.2 MWh/y (<3%)

Figure B8-44. BESTEST IN-DEPTH
Cases 220 to 270 (Delta)
Peak Heating and Sensible Cooling

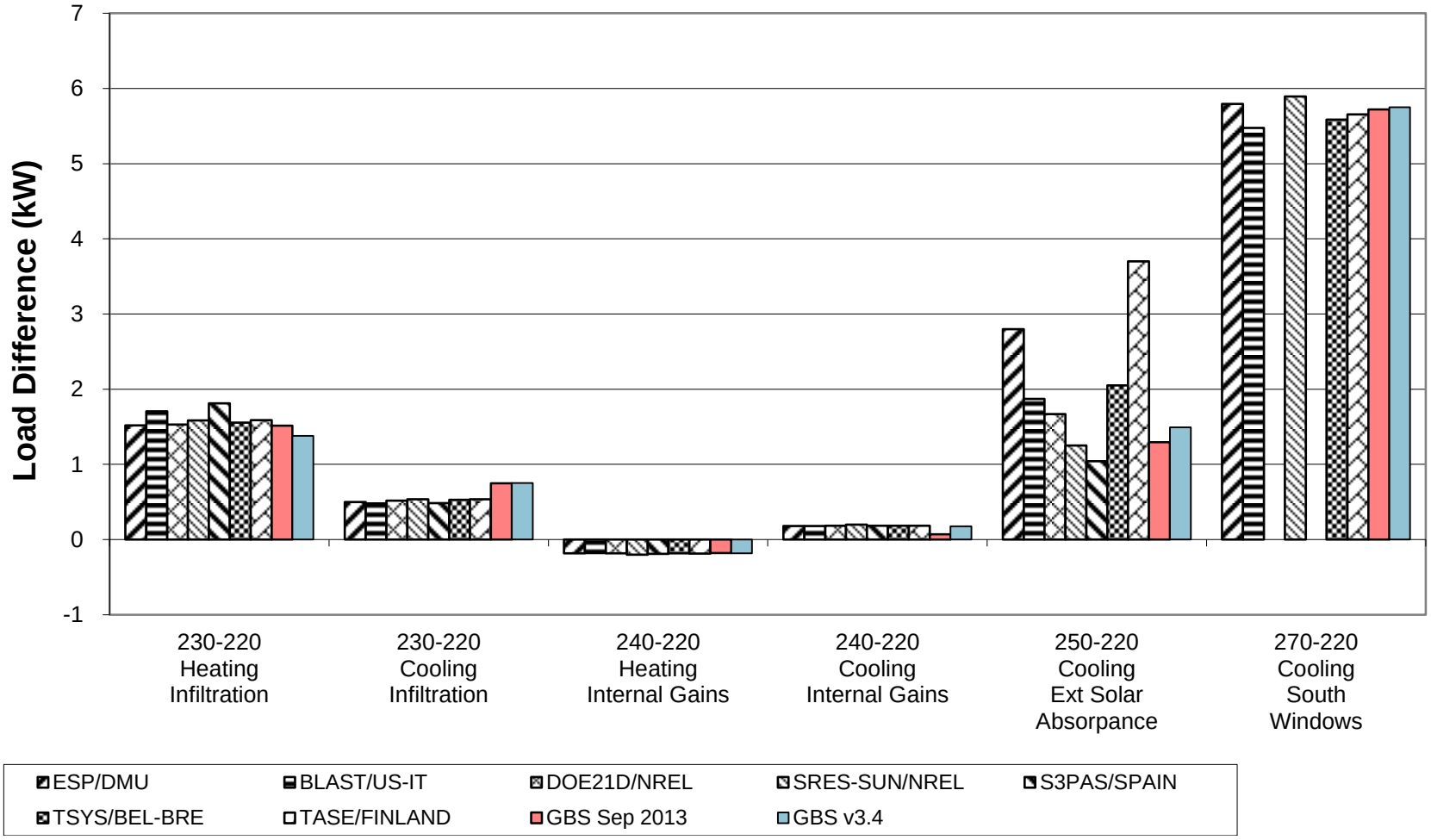
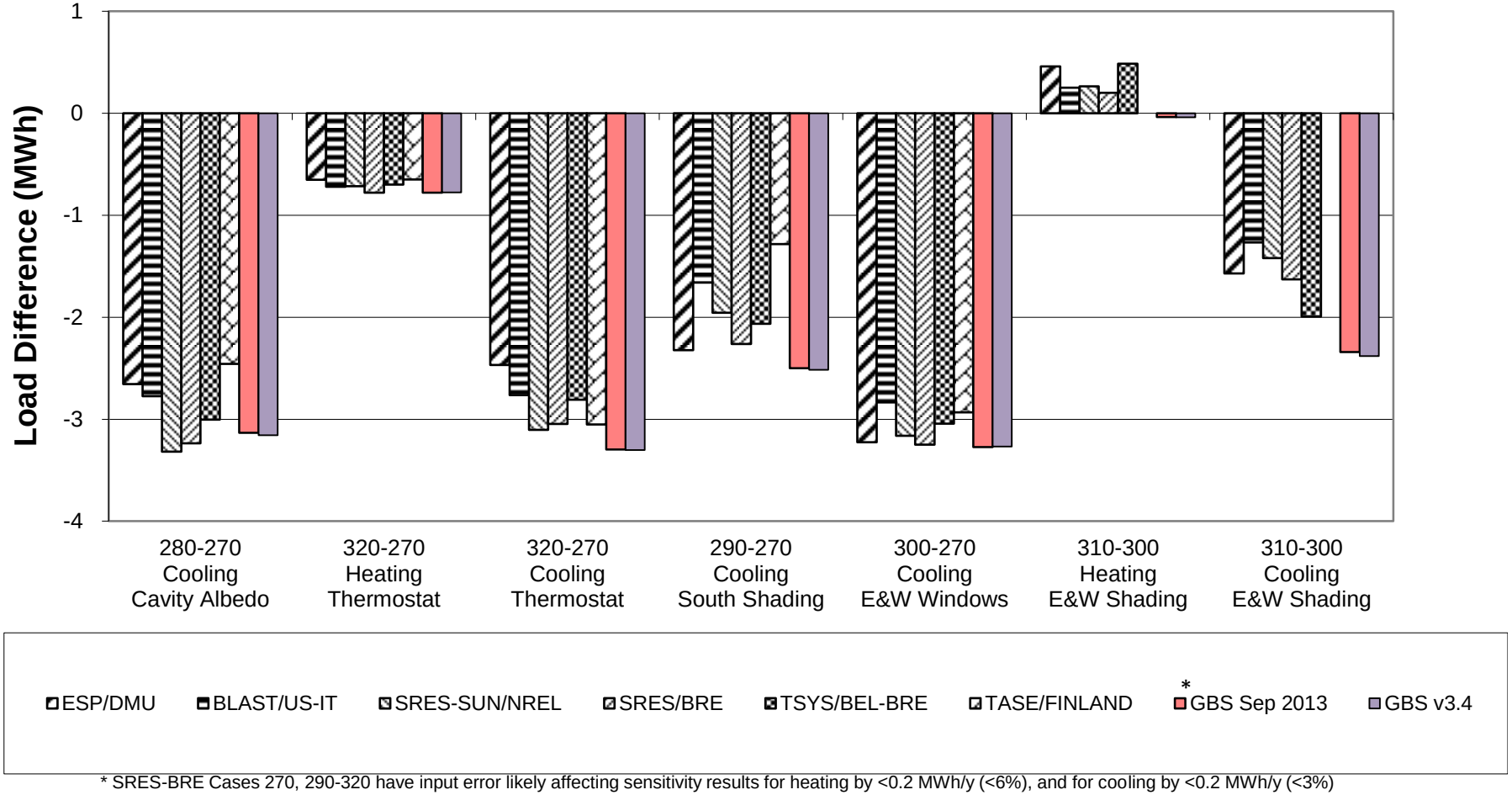


Figure B8-45. BESTEST IN-DEPTH
Cases 270 to 320 (Delta)
Annual Heating and Sensible Cooling



* SRES-BRE Cases 270, 290-320 have input error likely affecting sensitivity results for heating by <0.2 MWh/y (<6%), and for cooling by <0.2 MWh/y (<3%)

Figure B8-46. BESTEST IN-DEPTH Cases 270 to 320 (Delta) Peak Sensible Cooling

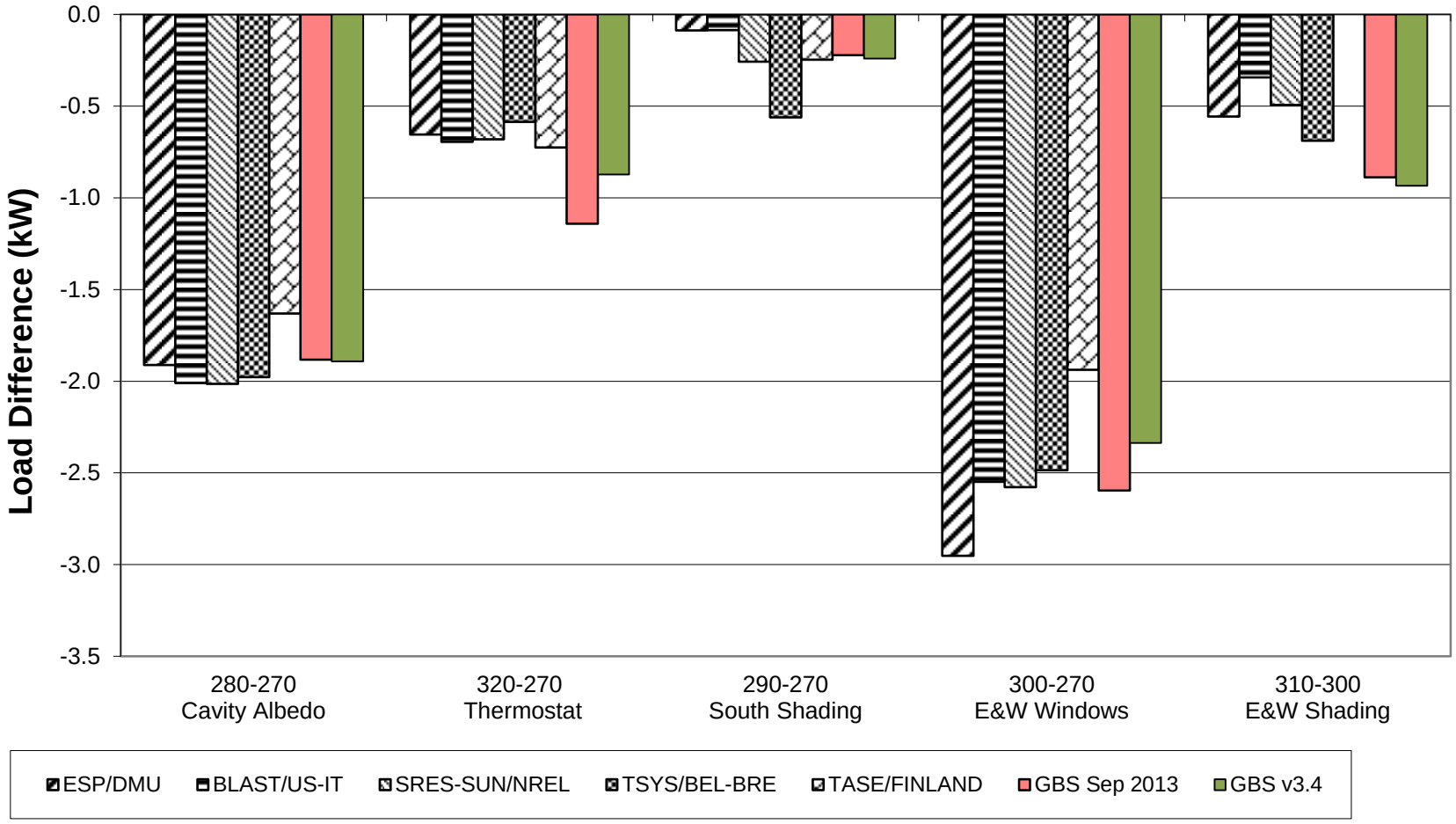


Figure B8-47. BESTEST IN-DEPTH
Annual Heating
Cases 395 to 440, 800, 810

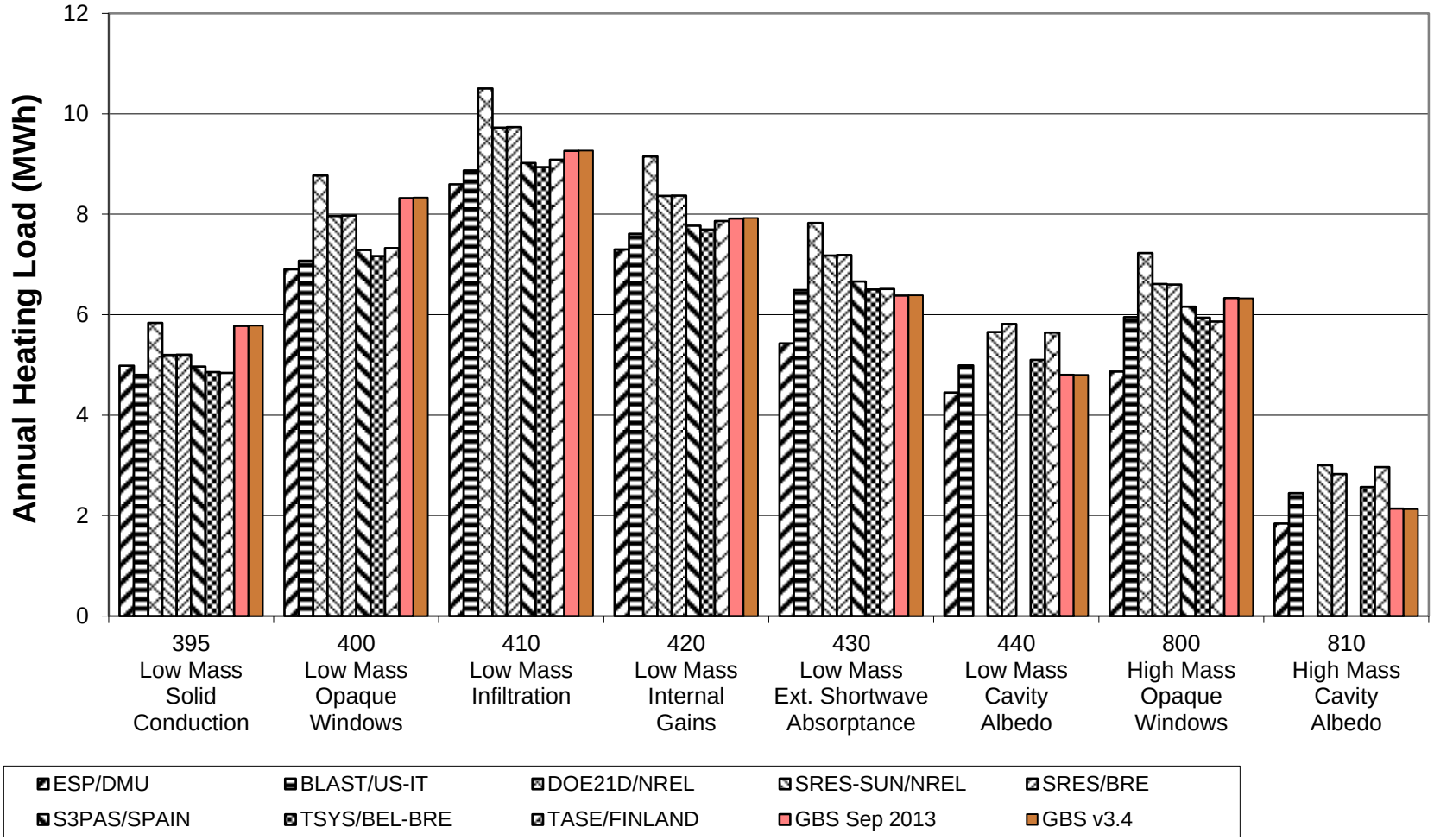


Figure B8-48. BESTEST IN-DEPTH
Annual Sensible Cooling
Cases 395 to 440, 800, 810

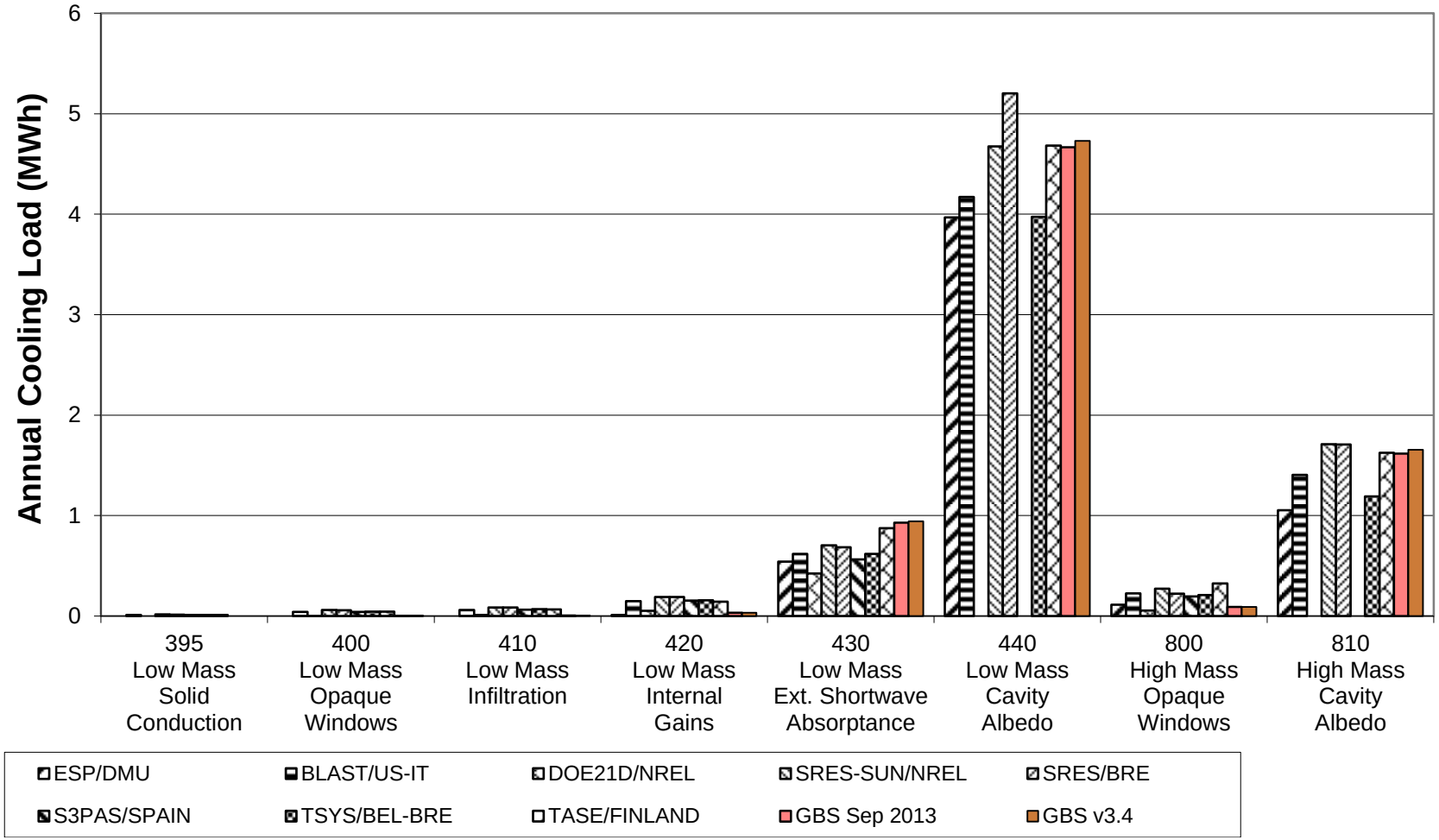


Figure B8-49. BESTEST IN-DEPTH
Peak Heating
Cases 395 to 440, 800, 810

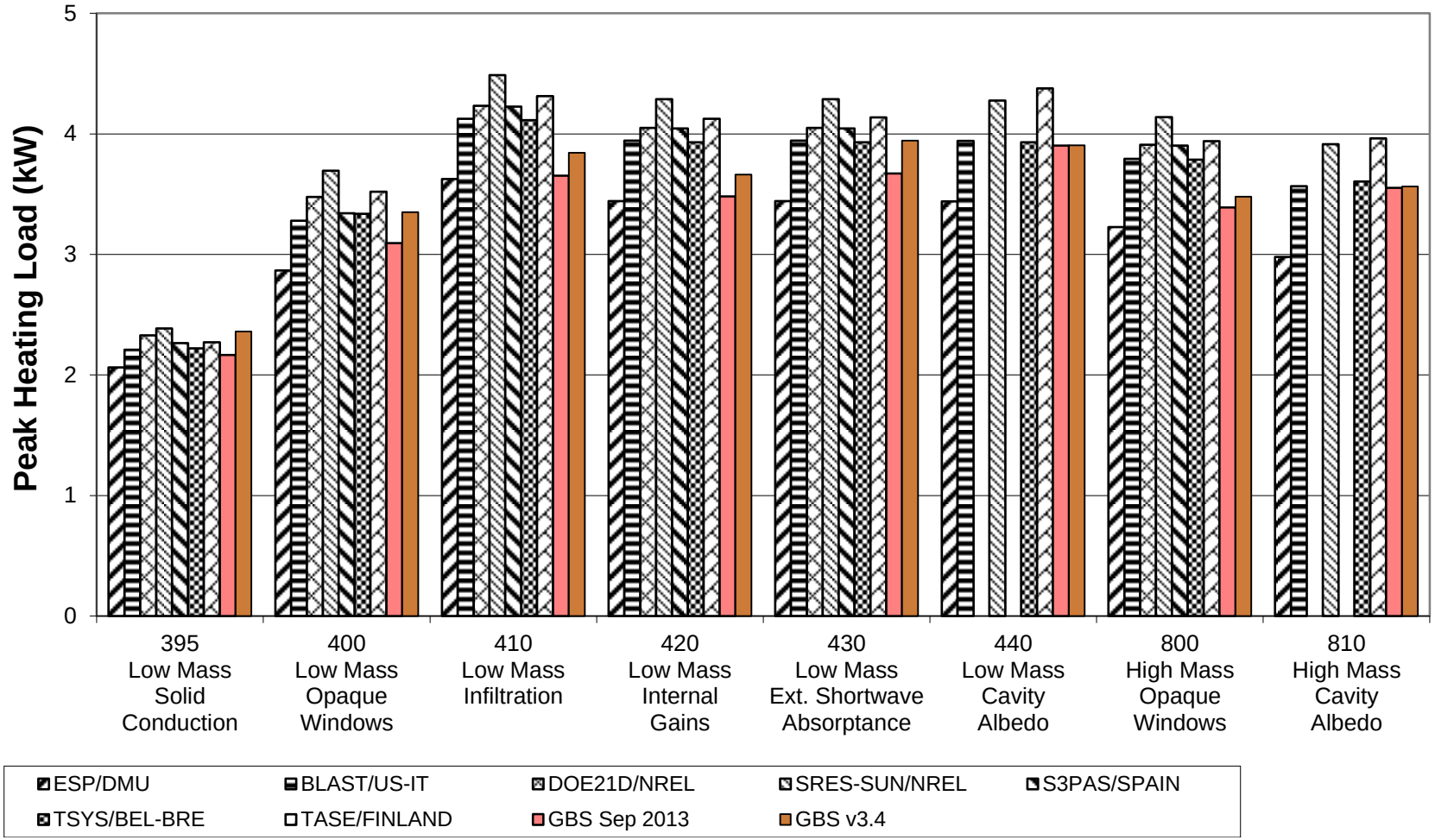


Figure B8-50. BESTEST IN-DEPTH
Peak Sensible Cooling
Cases 395 to 440, 800, 810

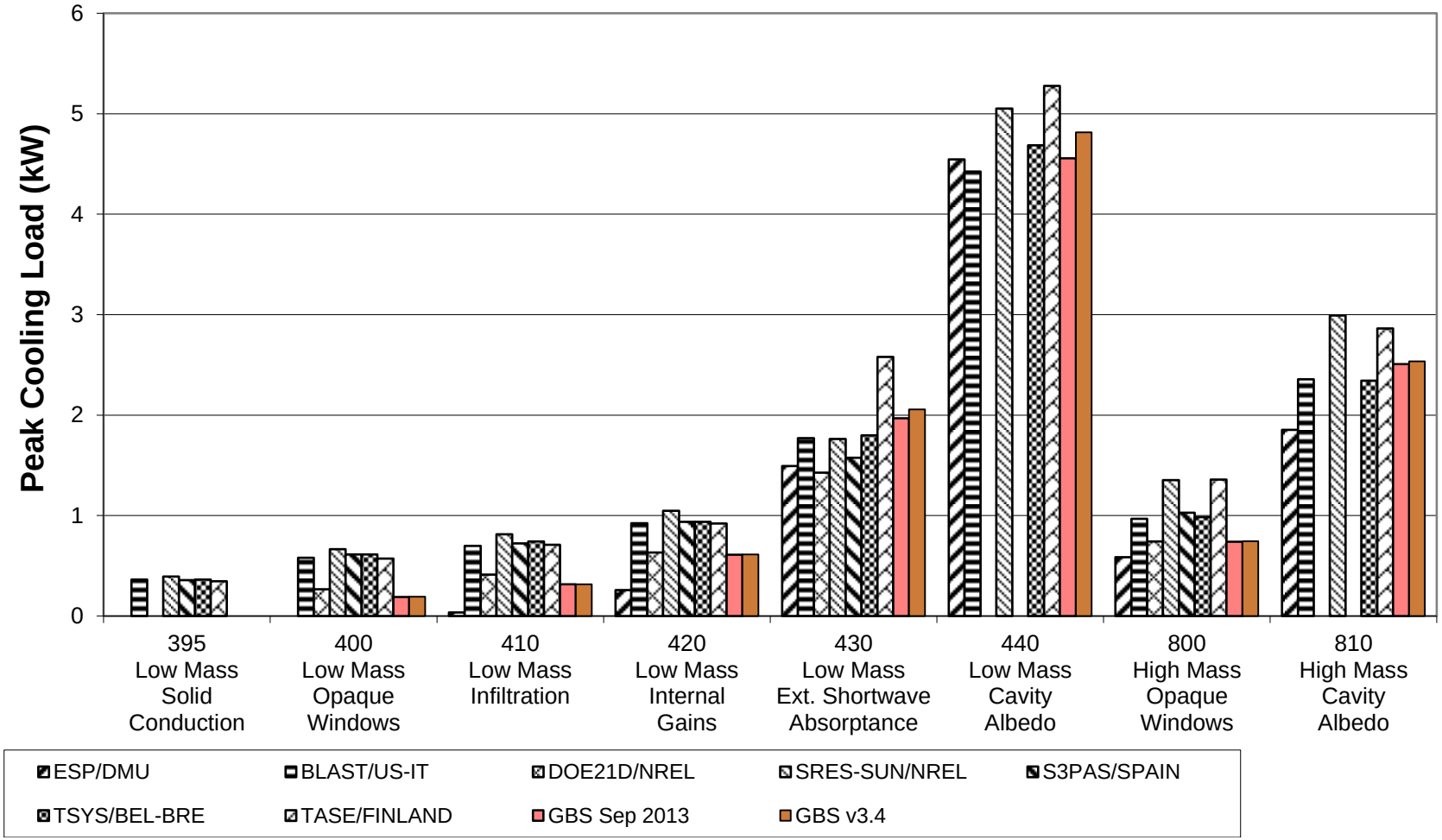


Figure B8-51. BESTEST IN-DEPTH
Cases 395 to 600 (Delta)
Annual Heating and Sensible Cooling

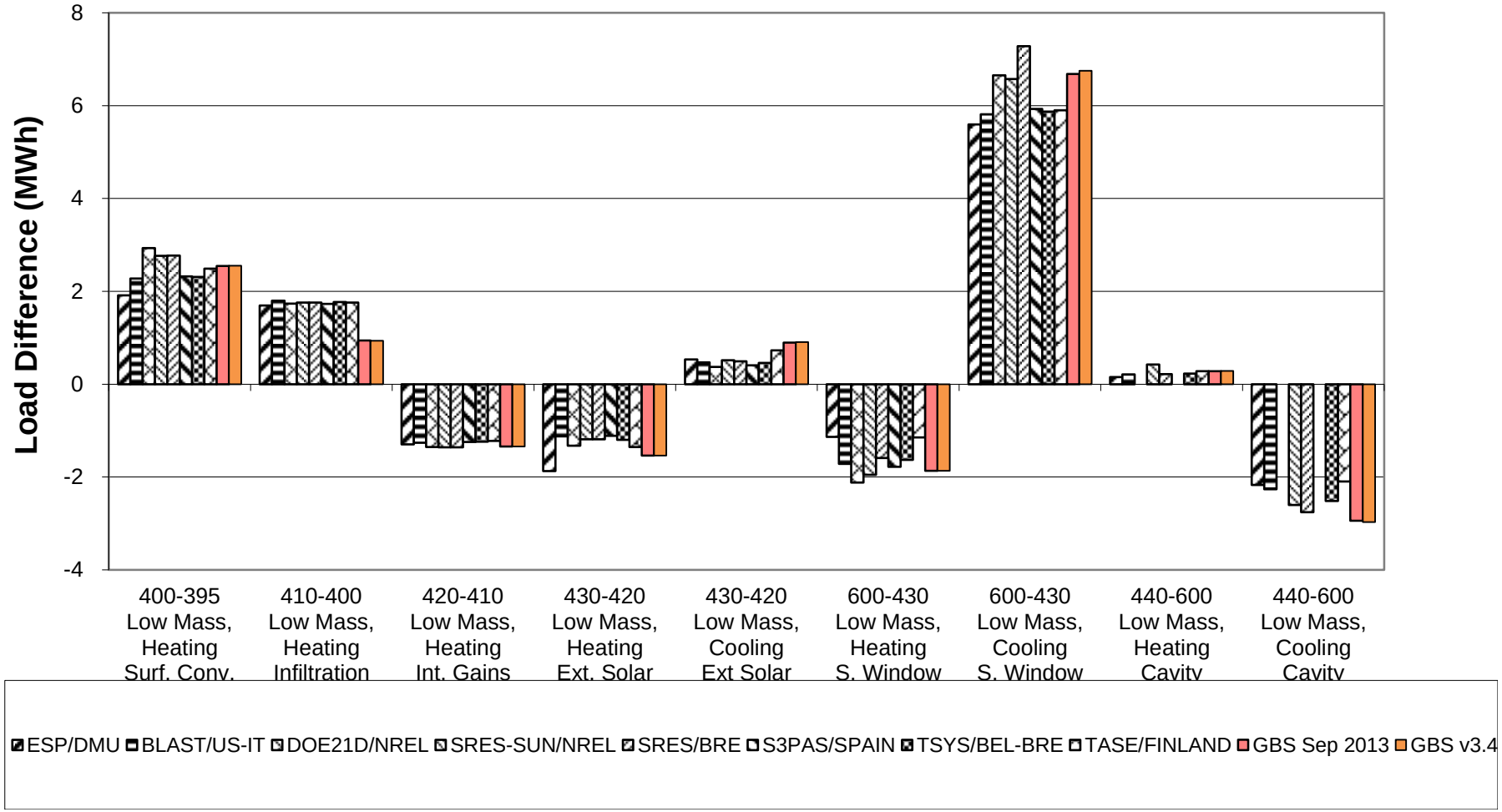


Figure B8-52. BESTEST IN-DEPTH
Cases 395 to 600 (Delta)
Peak Heating and Sensible Cooling

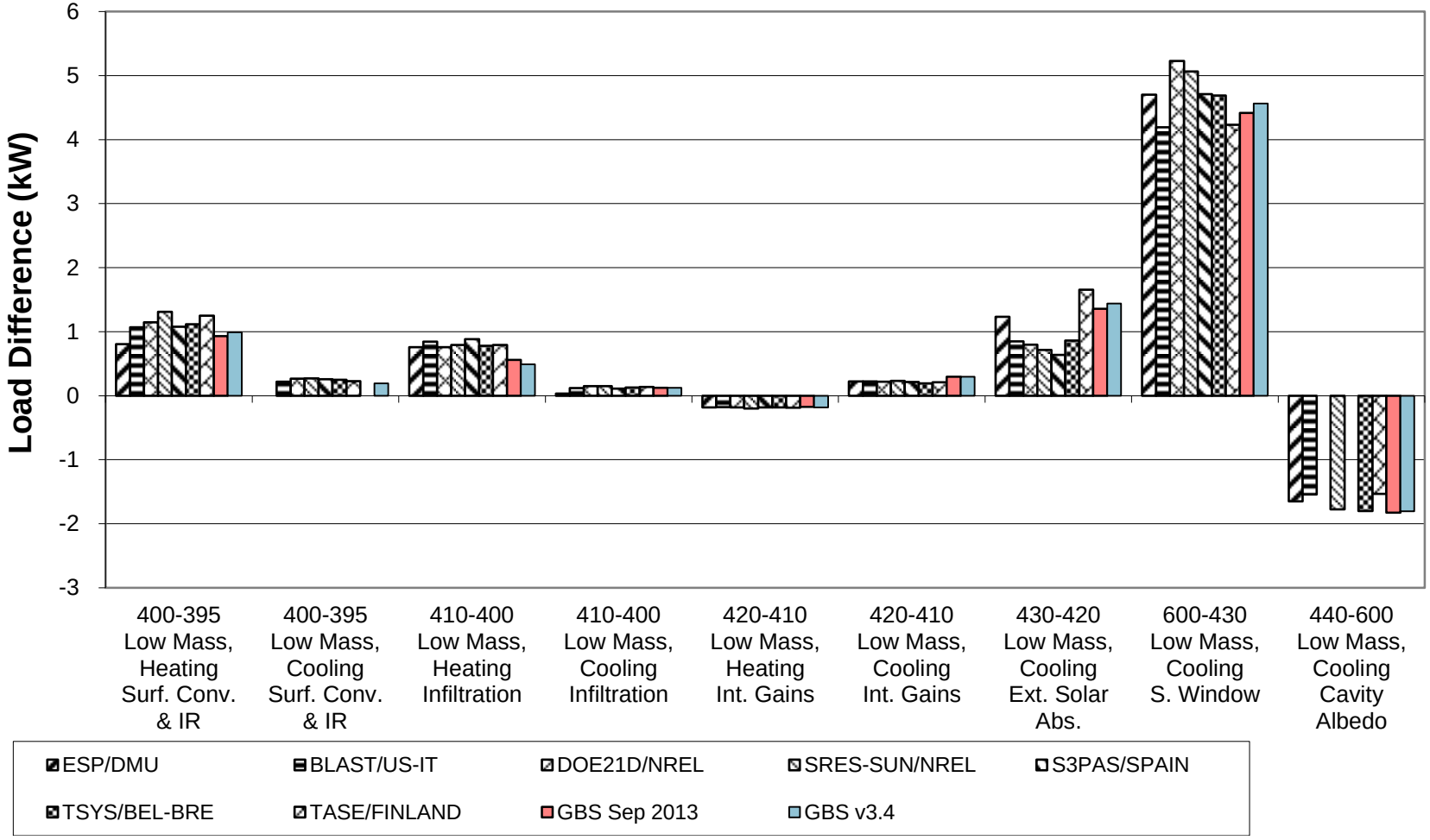


Figure B8-53. BESTEST Case 900FF
Annual Hourly Temperature Frequency

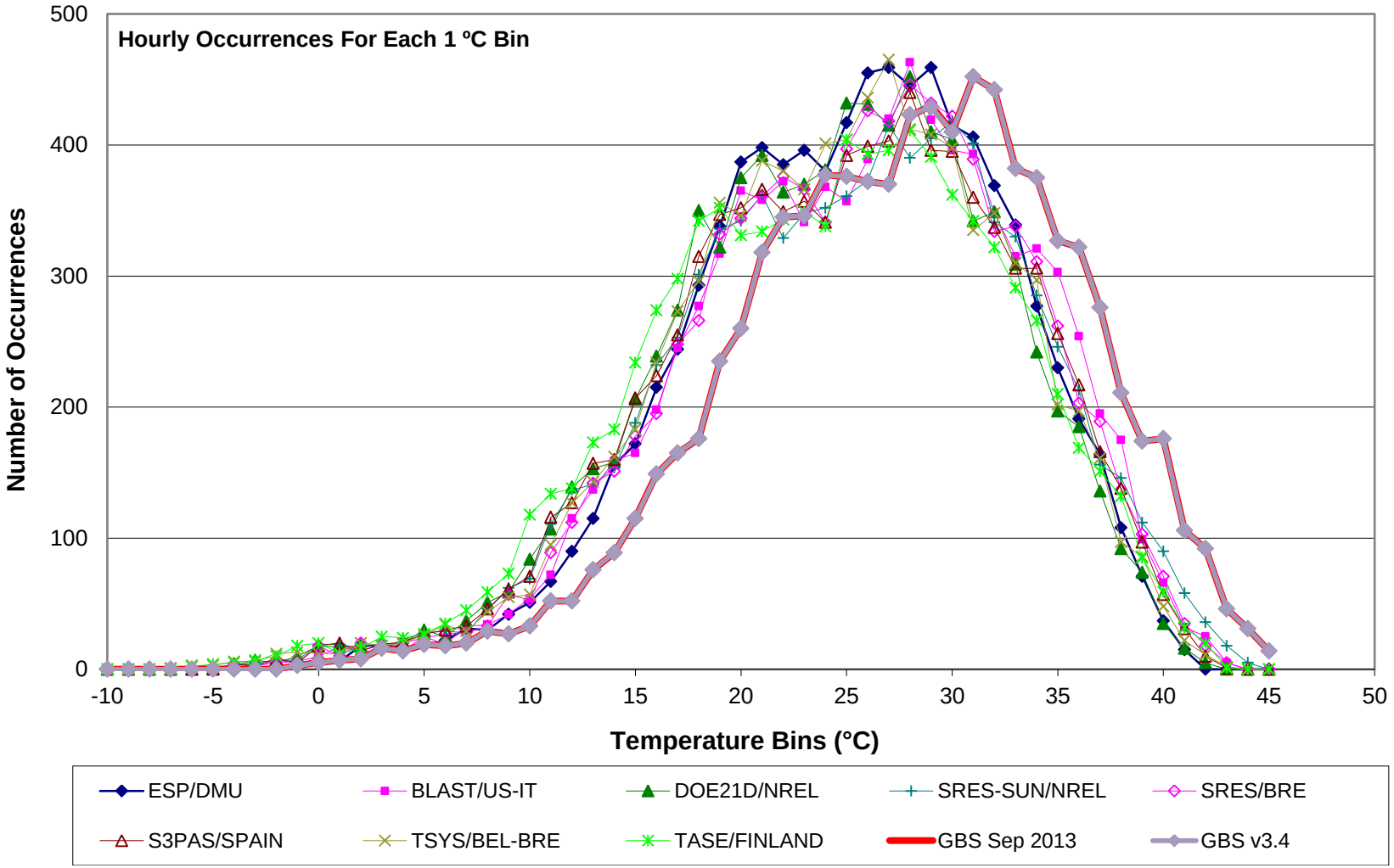


Figure B8-54. BESTEST Case 600
Cloudy & Clear Day Hourly Incident Solar
South Facing Surface

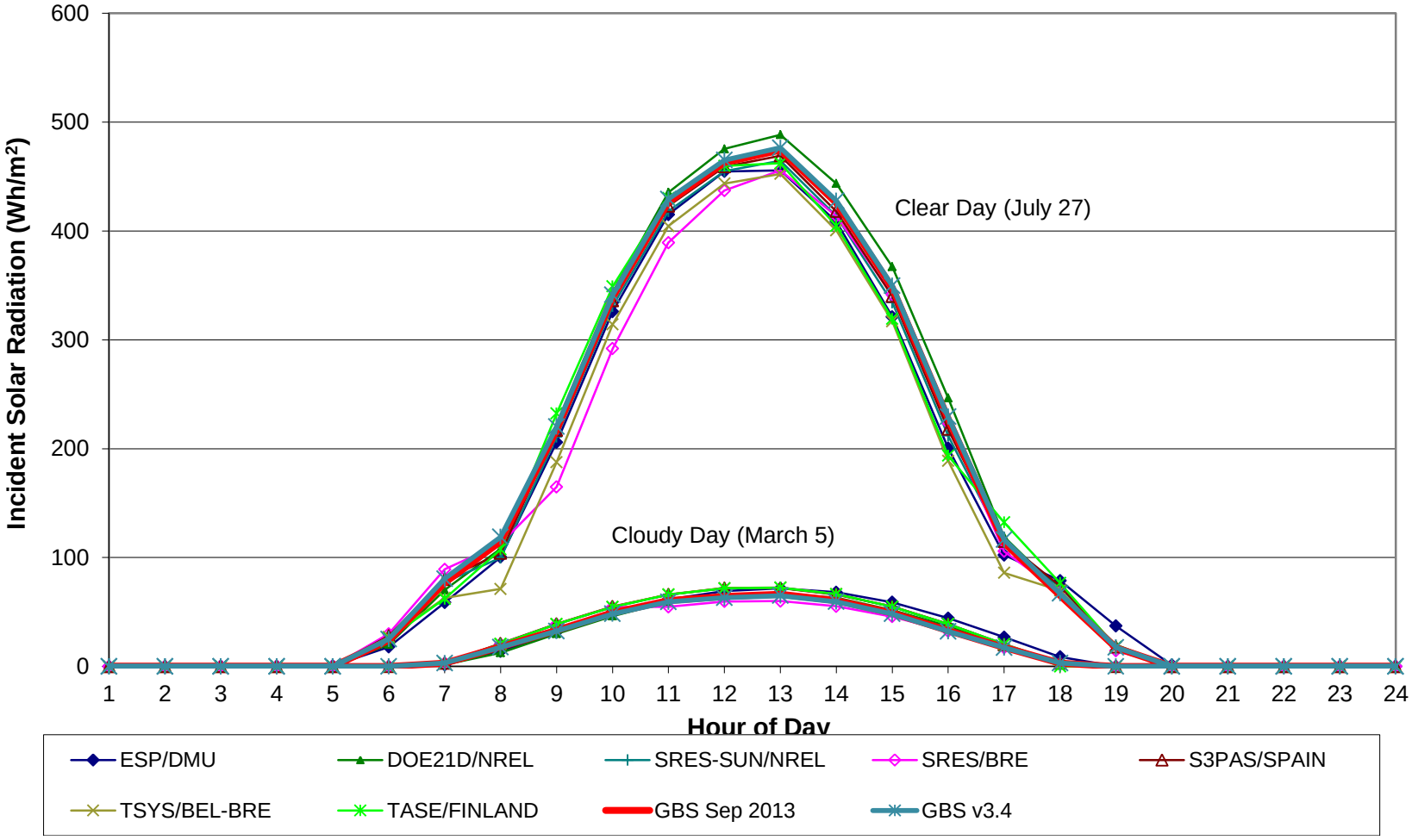


Figure B8-55. BESTEST Case 600
Cloudy & Clear Day Hourly Incident Solar
West Facing Surface

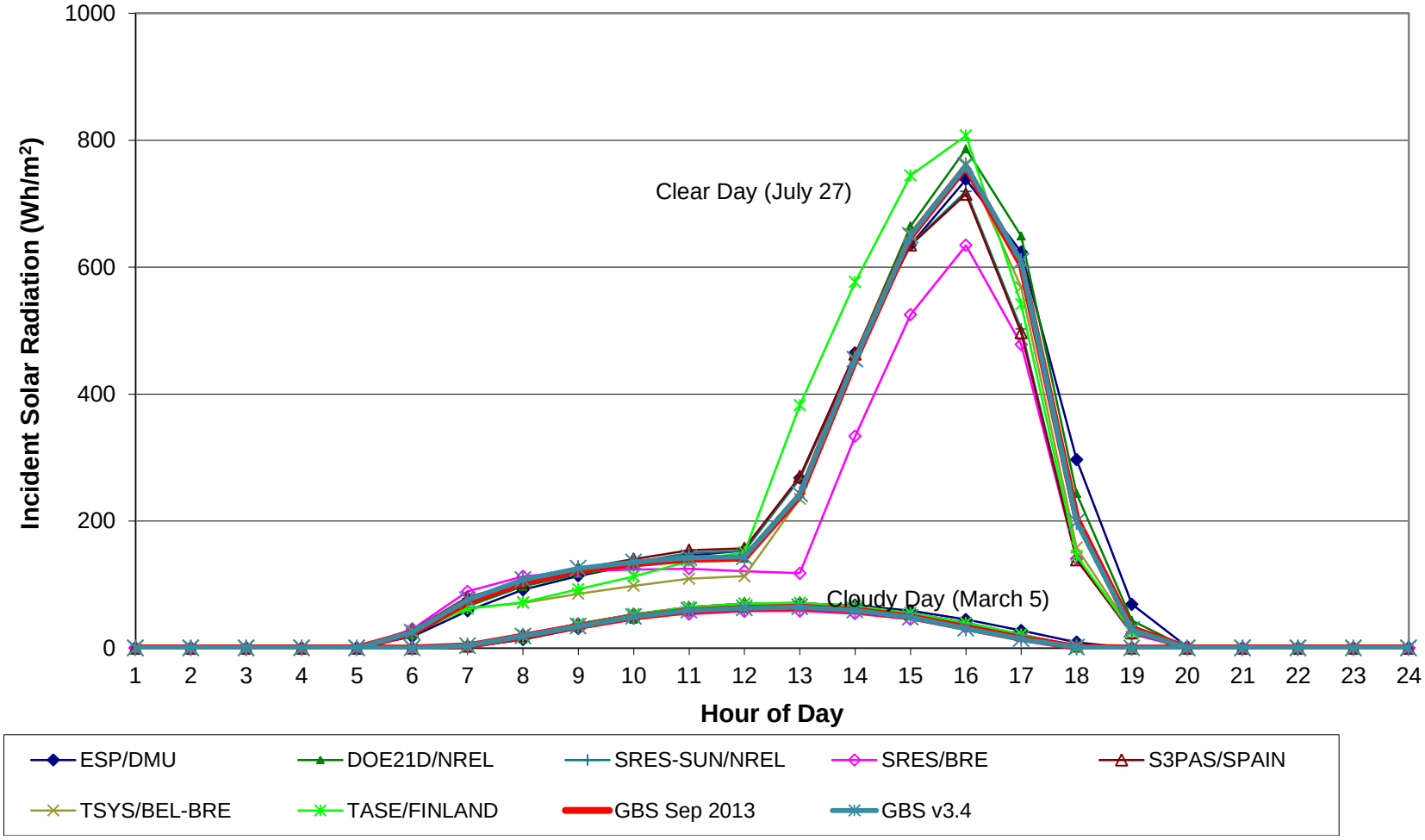


Figure B8-56. BESTEST
HOURLY FREE FLOAT TEMPERATURES
Clear Cold Day - Cases 600FF and 900FF

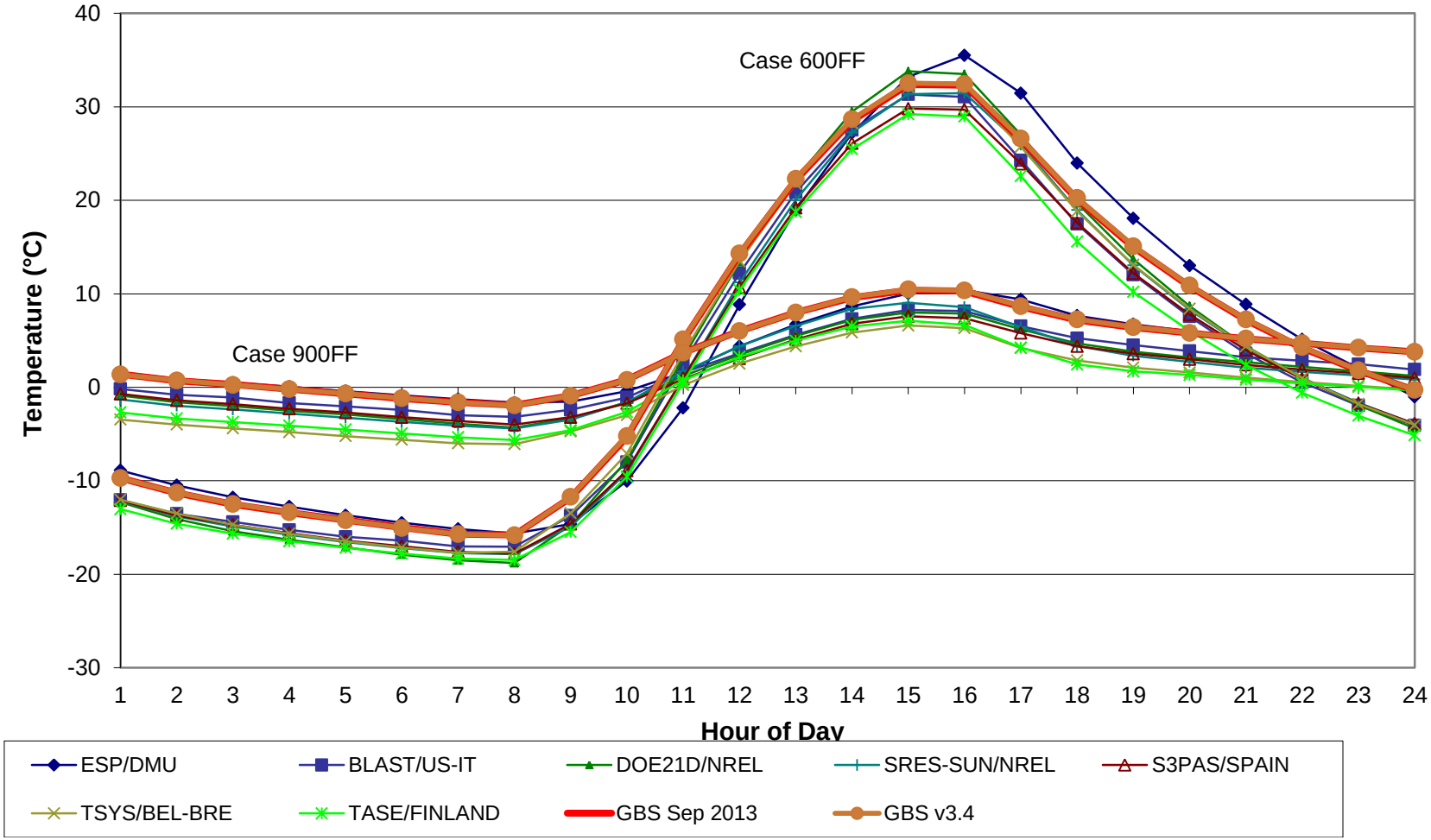


Figure B8-57. BESTEST
HOURLY FREE FLOAT TEMPERATURES
Clear Hot Day - Cases 650FF and 950FF

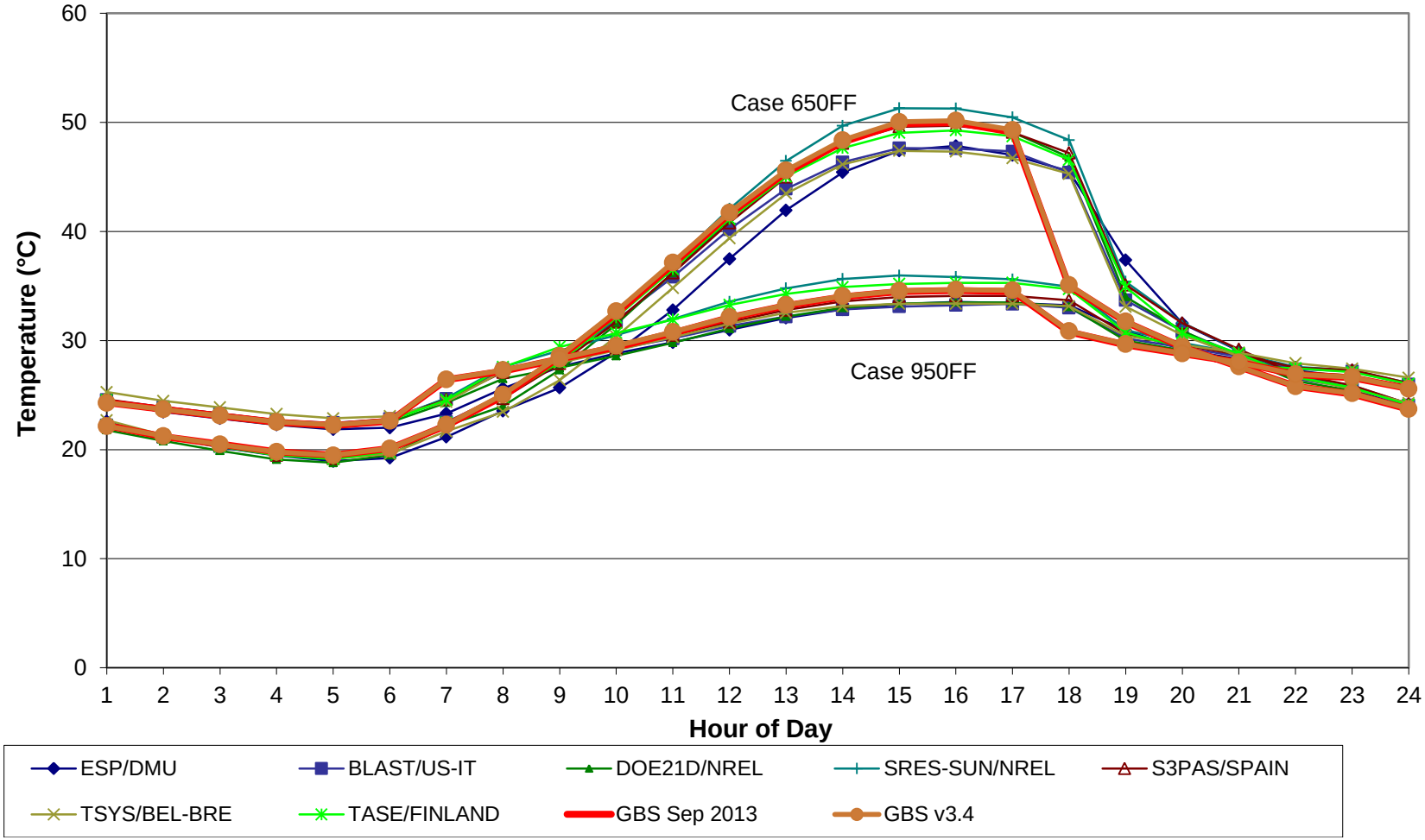


Figure B8-58. BESTEST HOURLY LOADS
Clear Cold Day, Case 600
Heating (+), Sensible Cooling (-)

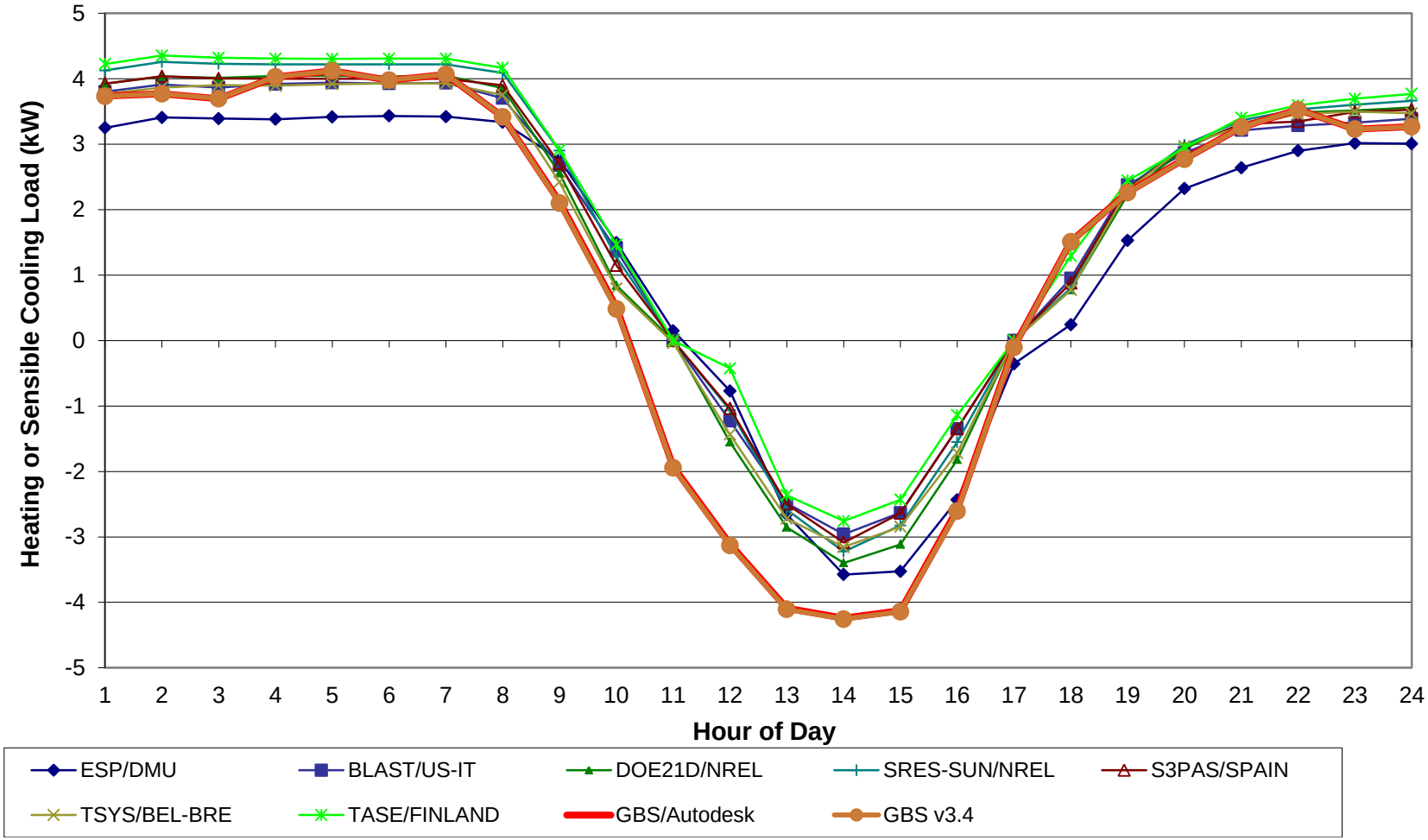


Figure B8-59. BESTEST HOURLY LOADS
Clear Cold Day, Case 900
Heating (+), Sensible Cooling (-)