



Country Building Energy Certification Programs Member Survey White Paper

ASHRAE Associate Society Alliance

January 12, 2012

AASA Energy Certification Subcommittee

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INTRODUCTION

In 1962, the ASHRAE Board of Directors approved the formation of an alliance of ASHRAE Associate Society representatives and ASHRAE representatives, to be known as the ASHRAE Associate Society Alliance, for the purpose of identifying possible cooperative efforts with Associate Societies in areas such as HVAC&R programs, research, education, etc. The Alliance meets annually in conjunction with the ASHRAE Winter Meeting or other venue(s) as is advantageous to both the Associate Societies and ASHRAE. The AASA provides for the fruitful exchange of ideas among engineers and today includes 55 organizations from around the globe. For more information visit <http://www.ashraeasa.org/>

As part of the fulfillment of the AASA goals, the Alliance put together a survey questionnaire to determine the extent of Building Certification and Labeling development around the globe. Responses to a wide range of questions identified current resources and contact data in each country related to primary energy sources, the extent of current or planned tracking of building energy consumption, and building performance benchmarks being developed and/or used.

This report includes a summary of the responses received from 35 of the Alliance members and provides a detailed illustration of the steps being taken to identify and benchmark building energy use. With the growing demand for energy, coupled with global concerns for the environmental impact of the use of that energy, increased focus is being given to energy consumption in buildings. In the United States, for instance, residential and commercial buildings account for 40% of all primary energy use and 70% of all electrical power generation. Reducing building energy use, particularly in existing buildings, can have a significant and positive economic and environmental impact.

This Report is seen as just the first step in what is hoped to be a periodic update/review that will allow AASA members to observe the trends happening in building energy certification and rating systems, globally. It is anticipated that future survey questions will seek to expand our knowledge data base and provide valuable information on successful programs.

ANALYSIS OF FINDINGS

Appendix B provides an overall synopsis of the responses received from the ASHRAE Associates Alliance members. Appendix C provides individual survey responses from each country.

Primary Energy Sources

Question 1: List the major primary sources of energy and their percentage of the total used to generate electricity in your country.

The collective information from **Question No.1** is summarized on **Chart 1 - Primary Energy Source**. It is clear from the data provided, that gas and coal remain the most significant sources of primary energy and are expected to retain or even expand that role over the next decade. While hydro still provides a significant percentage of energy for about one third of the countries responding, it is a resource that is not expected to expand due to limited potential for new dam construction. Nuclear energy has provided a substantial amount of electrical power generation for almost half the countries, further development is expected to be limited. With the growing availability of (relatively) low cost natural gas, the continued use of oil and petroleum is expected to be limited to peak power generation. What is surprising in the results is the rather slow growth of renewable energy. With so much emphasis on the potential of solar and wind energy, in addition to biomass and other renewables, they actually represent a total of only 5% of power generation. Wind power has received great publicity but currently only four countries have any significant amounts of wind generated power and only ten reported any wind power generation at all.

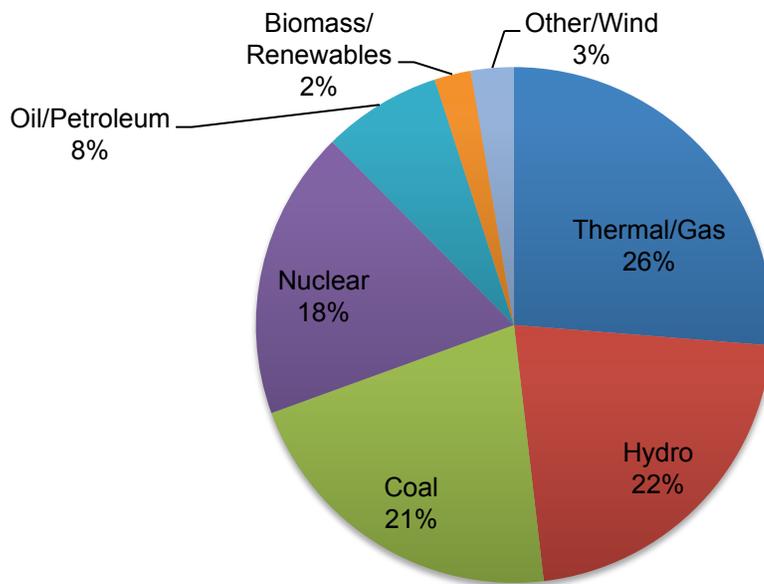


Chart 1 - Primary Energy Source

Renewable Energy Reimbursement

Question 2: Does the electric utility in your country reimburse building owners who generate electric renewable energy back to the electric grid?

Encouragement for further growth of renewable energy may be dependent upon the willingness of utility companies to buy back excess power generated. The survey results from **Question No. 2** shown in **Chart 2** indicate that the majority of countries (69%) do mandate that utilities buy back renewable power from Residential and Commercial customers.

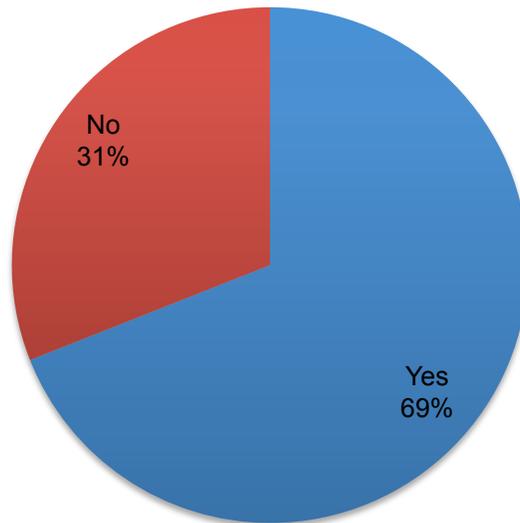


Chart 2 - Electric Utility Reimbursement for Renewable Energy

Benchmarking

Question 3: Does your country track average building energy consumption?

One of the primary objectives of National Building Energy Benchmarking is to truly understand the trends occurring in the built environment so that the impact of policies and legislation can be fully appreciated over time. A classic example of this has been the Commercial Building Energy Consumption Surveys (CBECS) that have been conducted every four years by the US Department of Energy – Energy Information Agency www.eia.doe.gov/emeu/cbecs. First conducted in 1979 (shortly after publication of ASHRAE Standard 90-75 Energy Efficiency in Buildings) the survey of commercial buildings has tracked the impact of increasingly more stringent energy codes and standards.

Over a thirty year period the CBECS survey initially indicated a positive trend in reducing building energy use (125,000 Btu/s.f.-yr in 1979 to 90,500 Btu/s.f.-yr in 1992 down to 85,100 Btu/s.f.-yr in 1999). Since that time, however energy use has trended high. While the building envelope and energy systems (lighting, HVAC, domestic hot water, etc) have become more

efficient, we are using far more electrical power for electrical and electronic equipment such as computers, printers, televisions, etc. The 2003 CBECS survey showed average energy use up at 91,000 Btu/s.f.-yr and that number is expected to continue to grow.

Chart 3 shows the survey results from **Question No. 3** for countries now tracking building energy consumption. Clearly these numbers are increasing – some the direct result of the Building Energy Performance Directive in Europe.

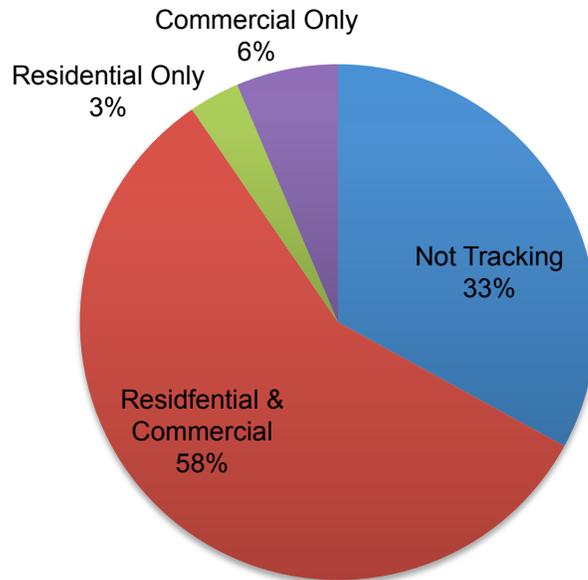


Chart 3 - Countries Tracking Building Energy Consumption

For the majority of countries, this data appears to typically be collected annually although the range varies widely from monthly to 5 years.

Appendix C shows the summary responses to Questions 5 through 11.

Question 6: What is the value of this building energy benchmarking database for your country?

The responses to **Question No. 6** indicates that there is generally a good recognition of the value of building energy benchmarking with responses ranging from important (or high) down to none. Most seem to see this activity as important and good and leading to help their statistical policy-making.

Question 7: What metric(s) are used in your country for building energy benchmarking (for example, kBtu/ft²-yr, kW/m²-yr, MJ/m²-yr, annual metric tons of CO₂e)?

A pleasant surprise was the consistent and overwhelming use of kWh/m²-yr (or variants thereof) in the response to **Question No. 7**, as the benchmarking metric used by 18 of the 23 countries responding on this issue. In a few instances kBtu/ft²-yr or MJ/m²-yr were used.

In the USA, a significant issue has been that of establishing a consistent metric for something as so seemingly a simple as building floor area. Clearly there are well-established precedents, particularly in the real estate leasing and operations industry where gross and net square footage or square meters have very specific meaning. ASHRAE's definition for *building floor area* is currently being finalized by our **Energy Targets Multidisciplinary Task Group**.

Question 8: If building area is used in the building energy metric please describe how it is calculated.

Chart 4 shows the responses to **Question No. 8** that addressed the basic issue of the use of building gross area versus conditioned area. A few countries do not related to building area at all while other responses varied widely.

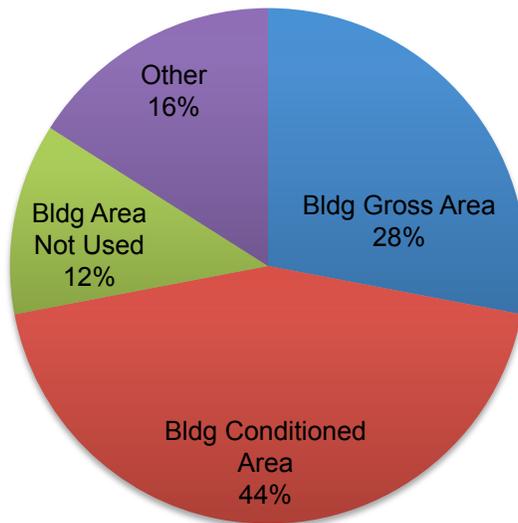


Chart 4 - Basis of Building Area

National Building Energy Certification/Labeling

Question 9: Is your country considering or have they implemented a building energy certification/labeling program?

Chart 5 shows the responses to Question No. 9 that identifies those countries that have considered or implemented a form of building certification or labeling. The answers reveal an overwhelming support for certification and labeling which is very consistent with global trends. Only one country specifically indicated that they had nothing planned

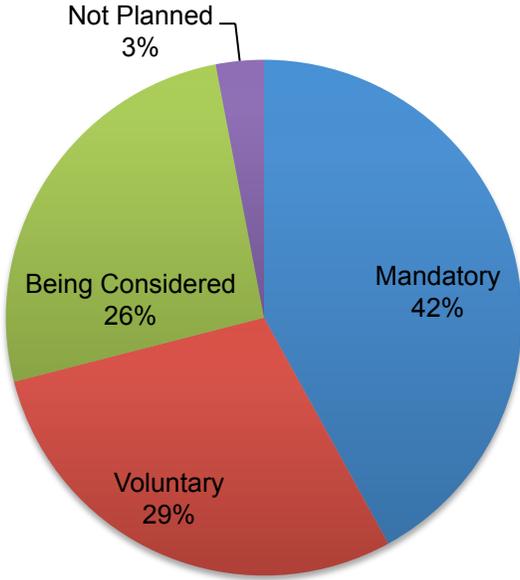


Chart 5 - Building Labeling Program

Question 10: Has the average building energy performance improved as a result of the building energy certification/labeling program in your country?

Chart 6 addresses Question No. 10 and shows that there has not been enough time or detail spent proving that the implementation of energy conservation measures has made a big impact or difference, in the opinion of the survey participants. Generally the majority feel like it is “too early” for the results to show up and be counted.

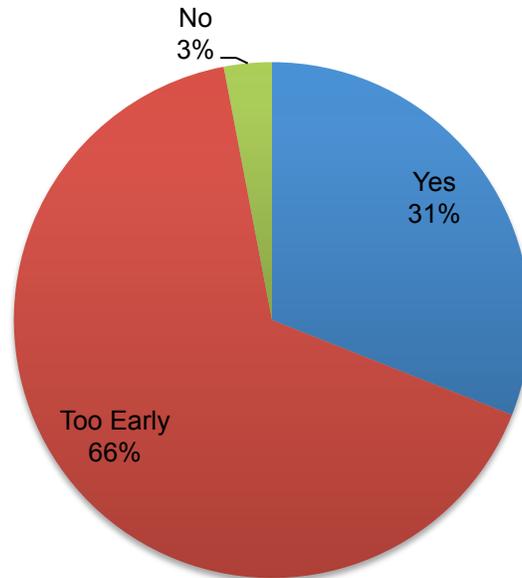


Chart 6 - Building Energy Performance Improvements

Question 11: What metric(s) are used in the building energy rating (for example, kBtu/ft²-yr, MJ/m²-yr, annual CO_{2e})?

The responses on building energy rating metrics Question No. 11, varied widely with the majority using kWh/m²-yr, others using Mj/m²-yr or kBtu/ft²-yr. Carbon Dioxide emissions were generally CO_{2e}/yr or kg CO_{2e}/m²-yr.

A key element in the USA and other countries has been the controversial issue of identifying site versus source energy. Site energy is relatively easy to identify so long as adequate metering is in place. But while metered energy can be used to identify the energy use intensity in a building (i.e. kWh/m²-yr) it does not necessarily identify the “total” energy used to produce and distribute that electrical power or steam, nor does it represent the environmental impact of that energy use. Source energy is seen by many the more accurate representation of building energy use. Typical factors used to convert site to source energy are 3.340 for electricity (reflective of generation efficiency of 35% and transmission losses of 10%); 1.047 for natural gas, 1.45 for steam; etc. For many years ASHRAE has utilized site energy in its standards almost completely; but lately there are some reconsideration of this past practice. In 2011, ASHRAE has initiated a

Presidential ad hoc committee to review this Industry practice and recommend a path forward for ASHRAE members to follow; results are expected by June 2012.

Question 13: The building energy certification is based on: site energy (energy measured at the building site); source energy (energy measured at the generation source); or Other?

Chart 7 reflects the response to **Question No. 13** on site versus source certification. Clearly the majority of countries use site energy at this time.

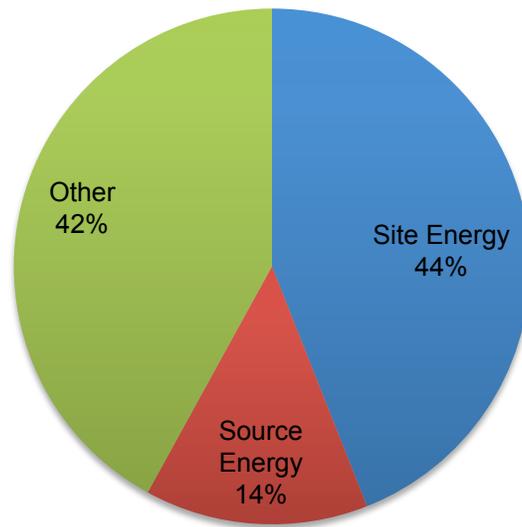


Chart 7 - Site versus Source Energy for Building Energy Certification

Question 14: Does the building energy certification/label normalize the measured energy for building operating schedules and weather?

Operating schedules of buildings can vary significantly from country to country depending on so many variables such as use, customs, business, occupancy, etc. Climatic conditions vary widely within small geographic regions. Weather conditions within those small regions can also vary significantly from year to year. If a high degree of accuracy is desired in establishing a long-term database, then normalization for weather and operating schedules is required. **Chart 8** identifies the responses to **Question No. 14** on normalization practices.

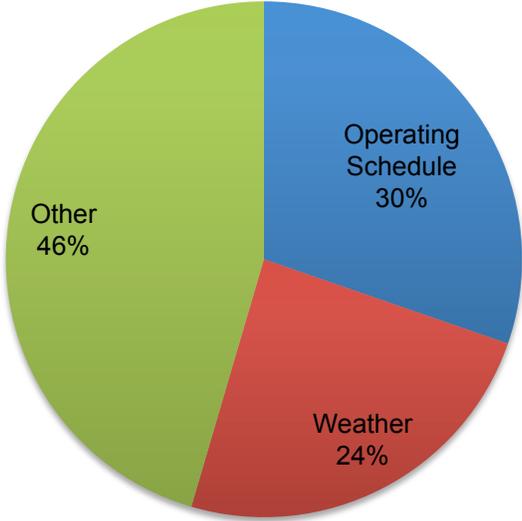


Chart 8 - Energy Normalization

Question 15: Are building energy certification/labeling appraisers or professionals (engineers or architects?) required to be accredited or certified?

The experience gained from the European Energy Performance of Buildings Directive (EPBD) clearly demonstrated the challenges in putting a comprehensive and effective program in place. One of the principle challenges is establishment of experienced energy auditing personnel that can track and report building energy use on a nationwide basis. Responses to **Question No. 15** indicate that a significant majority of countries use certified appraisers or professional engineers/architects to achieve these goals. As this practice develops it is expected that a new group of certified energy auditors will emerge to fill this role.

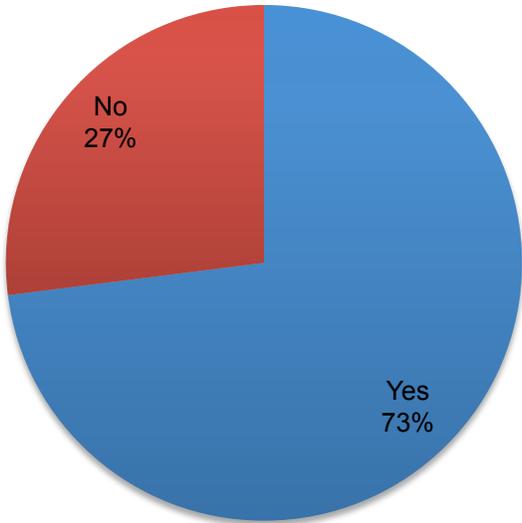


Chart 9 - Accredited and/or Certified Building Energy Appraisers

Question 16: Does your country utilize energy use auditing tools/software in normalizing the building energy rating?

Similarly the response to **Question No. 16** indicate that auditing tools and software are being widely used and this technology is expected to be refined as the industry matures.

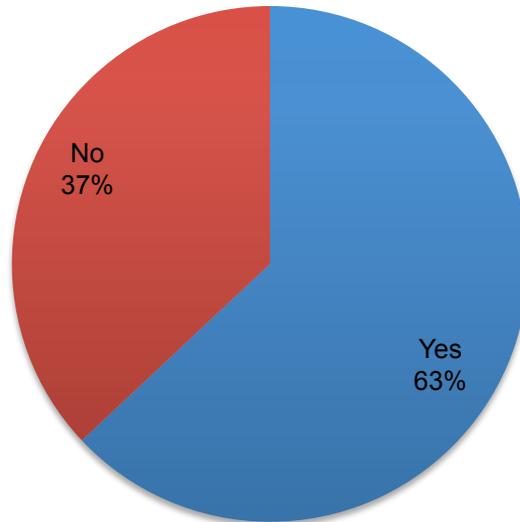


Chart 10 – Use of Energy Use Auditing Tools/Software

Question 17: List building types included in your country's building energy certification/labeling program.

Responses to **Question No. 17** indicate the number of building types used in the different energy certification programs; most countries reported using a broad coverage of most commercial building types, and just a few used residential and/or apartments.

CONCLUSIONS

The majority of countries are clearly concerned about energy use and a growing number are now tracking building energy consumption and benchmarking performance. The most widely used metric appears to be kWh/m².yr. There has been a significant increase in the number of countries mandating building energy labeling and certifications – led by the European nations through the EPBD. ASHRAE is now rolling out the bEQ Building Energy Quotient Labeling program. Given the research that has been done it appears inevitable that we are on a path forward towards mandating maximum building energy consumption, as against simply improving energy efficiency. (The NREL study for the Build America Program, documented building performance variations as great as 5:1 in identical buildings simply due to occupant behavior).

There is no question that the global economic turndown has significantly impacted our positive progress towards greater energy efficiency. Code intended standards such as ASHRAE Standard 90.1 are required to be cost effective and their required stringencies are increasing. In the USA the DOE Building Energy Codes Program has set a goal of 50% improvement in energy efficiency in Standard 90.1 compared to 90.1-2004. Yet we are seeing basic building energy prices actually falling (both coal and natural gas are actually lower in price in real dollars, compared to ten years ago). This makes it challenging to meet greater performance goals in our standards and codes so long as cost effectiveness is a primary factor.

Two non-economic factors probably underlie the determination to reduce energy use and those are **energy security and environmental consciousness**. Yet typically neither of these is accounted for in rationalizing changes to code intended standards. Energy security can relate to a broad number of issues such as reliability of imported energy and the resiliency in our distribution infrastructure. Atmospheric impact of energy use not only directly impacts the quality of our environment but also limits our options in future energy sourcing and usage.

Building energy performance will continue receive global attention for the long term. While improvements are being made in new building construction, addressing the performance of our existing building stock will remain a significant issue.

OTHER INFORMATION

The web site <http://buildingrating.org/> provides information on building energy performance rating programs used around the globe – with a Policy Map showing current rating systems. Refer to Appendix D.

REFERENCES

A Retrospective Analysis of Commercial Building Energy Codes 1990 to 2010 – US Department of Energy. Developed by Pacific Northwest National Laboratory (PNNL 20477)

The Energy Code Roadmap – An Assessment Tool and Resource Guide for State Governments – Building Codes Assistance Project (BCAP)

U.S. DOE Energy Efficiency and Renewable Energy (EERE) Building Technologies Program – <http://www1.eere.energy.gov/buildings/index.html>

ENERGY STAR – <http://www.energystar.gov/>

Energy Efficiency and Renewable Energy Building Energy Codes Program – <http://www.energycodes.gov/>

APPENDIX A - BUILDING ENERGY CERTIFICATION QUESTIONS

Questions marked with an asterisk (*) are mandatory.

*Organization:

*Country:

*Person Completing Survey:

*Email Address:

Country Energy Questions

- 1.* List the major primary sources of energy and their percentage of the total used to generate electricity in your country.
- 2.* Does the electric utility in your country reimburse building owners who generate electric renewable energy back to the electric grid?

National Building Energy Benchmarking Questions

- 3.* Does your country track average building energy consumption?
NO, we do not track national building energy consumption
YES, we track both residential and non-residential building energy consumption
YES, we track only non-residential building energy consumption
YES, we track only residential building energy consumption

If you answered NO to Question 3, please skip to Question 9

4. Please provide web address to the building energy benchmarking database or building energy report for your country.
5. How often is this information updated?
6. What is the value of this building energy benchmarking database for your country?
7. What metric(s) are used in your country for building energy benchmarking (for example, kBtu/ft²-yr, kW/m²-yr, MJ/m²-yr, annual metric tons of CO₂e)?
8. If building area is used in the building energy metric please describe how it is calculated.
Building gross area
Building conditioned area only
Building area is NOT used
Other, please describe

National Building Energy Certification/Labeling Questions

- 9.* Is your country considering or have they implemented a building energy certification/labeling program?
Currently exists as mandatory requirement
Currently exists as voluntary program
Considering
Nothing planned
10. Has the average building energy performance improved as a result of the building energy certification/labeling program in your country?
Yes, provide comment
Too early to determine
No
11. What metric(s) are used in the building energy rating (for example, kBtu/ft²-yr, MJ/m²-yr, annual CO₂e)?
12. Describe (or provide web address for how the building energy certification/label is established?
13. The building energy certification is based on:
Site energy (energy measured at the building site)

- Source energy (energy measured at the generation source)
Other, please describe
14. Does the building energy certification/label normalize the measured energy for building operating schedules and weather?
Building operating schedule
Weather
Other, please describe
15. Are building energy certification/labeling appraisers or professionals (engineers or architects?) required to be accredited or certified?
Yes, describe qualifications or provide web address
No
16. Does your country utilize energy use auditing tools/software in normalizing the building energy rating?
Yes, please describe
No
17. List building types included in your country's building energy certification/labeling program:

APPENDIX B - BUILDING ENERGY CERTIFICATION SURVEY SUMMARY SHEET

The following is a brief synopsis of the responses received from 35 of the AASA members:

Question No. 1 Major Primary Sources of Energy to Generate Electricity. All of the countries responding showed a great diversity in energy sources. On a overall average basis (not by volume used)

Thermal/Gas	26.4%
Coal	21.4%
Hydro	22.0%
Nuclear	18.2%
Oil/ Petroleum	7.5%
Biomass/Renewables	2.3%
Other/ Wind	2.7%

Of interest is the fact that only four countries had any appreciable use of Wind Energy, providing an average of 8.5% of their energy generated, but overall just 1.2% of power generated.

Question No. 2 Electrical Utility Reimbursement for Renewable Energy Generation – 68.6% of respondents (24 out of 35) said Yes, 31.4% of respondents (11 out of 35) said No.

Question No. 3 Tracking Average Building Energy Consumption -

31% (or 11 out of 35)	Answered – No
54% (or 19 out of 35)	Answered - Yes (both Residential and Commercial)
9% (or 3 out of 35)	Answered - Yes (only Residential)
6% (or 2 out of 35)	Answered - Yes (only Commercial)

Question No. 4 Web Address – See Current Resources Sheet 1

Question No. 5 Update of Information – Responses varied widely from three months to 5 years. The majority answered - Annually

Question No. 6 Value of Benchmarking – Generally appears to be seen as a value. Only two respondents said No value

Question No. 7 Benchmarking Metrics – kWh/m²-yr appears to be a fairly widely used metric

Question No. 8 Building Area – Of those responding 28% Answered Bldg Gross Area, 44% Answered Bldg Conditioned Area, 12% Answered Bldg Area Not Used and 16% answered Other

Question No. 9 Labeling Program – Of those responding 43% Answered - Mandatory, 29% Answered Voluntary, 26% Answered Being Considered, and 3% Answered Not Planned

Question No. 10 Performance Improvements - Of those responding 31% Answered -Yes, 66% Answered -Too Early and 3% Answered -No

Question No. 11 Energy Rating Benchmarks – Performance Rating Benchmarks varied widely with the majority using kWh/m²-yr, others using Mj/m²-yr or kBtu/ft²-yr. Carbon Dioxide emissions were generally CO₂e/yr or kg CO₂e/m²-yr

Question No. 12 web address for Certification – See Report

Question No. 13 Energy Certification Basis - Of those responding, 48% Answered -Site, 15% Answered -Source and 36% Answered -Other

Question No. 14 Normalization - Of those responding 30% Answered -Schedule, 24% Answered - Weather and 45% Answered - Other

Question No. 15 Certified Appraisals - Of those responding 73% Answered -Yes, 27% Answered No

Question No. 16 Auditing Software - Of those responding 63% Answered -Yes, 37% Answered - No

Question No. 17 Building Types - See Report but there was generally fairly broad coverage.

APPENDIX C - SURVEY RESPONSES RECEIVED

Acronym	Country	Contact E Mail	Energy Benchmarking Data Base Web Site
AAF	Argentina	rraguilo@yahoo.com	www.camessa.com
ABOK	Russia	brodatch@abok.ru	http://minenergo.gov.ru/ http://www.minregion.ru/
ABRAVA	Brazil	presidencia@abrava.com.br	-
ACAIRE	Columbia	cbg@cbgingenieria.com	-
ACAIRE 2	Columbia	acairecolombia@etb.net.co	-
ACTECIR	Catalonia	president@actecir.cat joan.vidal@honeywell.com	ICAEN (Catalan Energy Agency) http://www20.gencat.cat/portal/site/icaen
AGFR-AIIR	Romania	Florin_chiriac@yahoo.com fliod@yahoo.com rdumitrescu1709@yahoo.com	www.anre.ro
AHGWTEL	Latvia	aldia.grekis@lg.lv	www.malkalne.lv
AICARR	Italy	c_casale@hotmail.com	www.enea.it
AICVF	France	b.montmoreau@aicvf.net	www.adme.fr
AMERIC	Mexico	direccion@americmx.com	http://sie.energia.gob.mx
ASBRAV	Brazil	accessoria@asbrav.org.br	-
ASHRAE	Canada	Darryl_boyce@carleton.ca	CIBEUS 2000 : http://oee.nrcan.gc.ca/corporate/statistics/neud/dpa/cibeus_tables.cfm?attr=0
ASHRAE	USA	kent.peterson@p2seng.com	http://www.eia.doe.gov/emeu/cbecs/Building energy http://buildingsdatabook.eere.energy.gov
ASURVAC	Uruguay	abertolotti@lliconsult.com	-
ATEOYR	Spain	lbarrientos@ameresco.com	-
ATIC	Belgium	gabrielle@masy@hepl.be	http://energie.wallonie.be/fr/bilcan_energetique-wallon.html?IDC=6288
DKV	Germany	DKV.Jakobs@dkv.org	http://www.bmvbs.de/cae/servlet/contentblob/44008/publicationFile/1196/co2-gebaeudereport-kurzfassung-barrierefreies-pdf-dokument.pdf http://www.bmvbs.de/cae/servlet/contentblob/45040/publicationFile/1460/co2-gebaeudereport-langfassung.pdf
EFRIARC	Portugal	carloslx@carloslisboa.pt	
FINVAC	Finland	maiya.virta@figbc.fi	www.stat.fi/statistics/energy/energy consumption tables/ - electricity consumption - production and consumption of district heating
IOR UK	United Kingdom	president@ior.org.uk	http://www.communities.gov.uk
ISHRAE	India	ashishrakheja@spectralservices.net	Bureau of Energy Efficiency - http://www.bee-india.nic.in/

Acronym	Country	Contact E Mail	Energy Benchmarking Data Base Web Site
JSRAE	Japan	shokjm@cc.saga-u.ac.jp miyara@me.saga-u.ac.jp	The Energy Data and Modeling Center, The Institute of Energy Economics, Japan http://www.ieej.or.jp/edmc/index-e.html
KGH	Serbia	todorob@eunet.rs	-
LITES	Lithuania	stasys.sinkunas@ktu.lt	http://www.lsta.lt/lt/pages/apie-silumos-uki/silumos-suvartojimo-analize
OEA	Lebanon	rabiikhairallah@hotmail.com	-
PHVAC	Pakistan	smc.khi@smehboob.com	Ministry of Water & Power. Govt of Pakistan
SAIRAC	South Africa	erik@bemer3000.co.za	www.gbcsa.org.za
SAREK	Korea	hvac@sarek.or.kr , hsyoo@ssu.ac.kr	http://www.kostat.go.kr/ http://www.kemco.or.kr/data/e_static/energy_chart/energy_static_view_main.a sp
SITHOK	Slovenia	sithok@fs.un-lj.si	-
STP	Czech Repub	kabele@fsv.cvut.cz	-
SWEDVAC	Sweden	gehlin@emtf.se	http://enrgimyndigheten.se
SWKI	Switzerland	adrian.altenburger@amstein- walthert.ch	http://www.bfe.admin.ch/themen/00526/00541/00542/index.html?lang=en
TTMD	Turkey	Tunc.korum@formgroup.com	-
TVVL	Netherland	w.maassen@royalhaskoning.com	-

Survey Responses Questions 1-3

Acronym	Country	Question #1 Energy Sources							Question #2	Question#3
		Hydro	Thermal Gas	Nuclear	Petro Oil	Coal	Wood Biomass	Import Other	Renewables Reimbursement	National Building Energy Benchmarks
AAF	Argentina	45%	45%	8%	0	0	0	0	No	3
ABOK	Russia	14%	0	17%	0	68%	1%	0	Yes	2
ABRAVA	Brazil	73%	6%	3%	3%	2%	5%	0	No	1
ACAIRE	Columbia	63%	24%	0%	4%	7%	2%	0	No	1
ACAIRE 2	Columbia	66%	34%	0	0	0	0	0	Yes	1
ACTECIR	Catalonia	8%	40%	47%	1%	0	2%	0	Yes	2
AGFR-AIIR	Romania	10%	65%	25%	0	0	0	0	-	2
AHGWTEL	Latvia	0	90%	0	0	0	10%	0	Yes	4
AICARR	Italy	0	19%	0	0	81%	0	0	Yes	2
AICVF	France	5%	11%	79%	0	0	0	0	Yes 5%	2
AMERIC	Mexico	8%	68%	0	7%	9%	8%	0	No	2
ASBRAV	Brazil	85%	0	0	0	0	0	15%	No	1
ASHRAE	Canada	16%	5%	61%	1%	1%	15%	0	Ontario	2
ASHRAE	USA	7%	23%	20%	0	45%	4%	1%	Yes	2
ASURVAC	Uruguay	?	?	?	25%	?	0	?	Yes	1
ATECYR	Spain	15%	34%	24%	8%	0	2%	17% *	Yes	1
ATIC	Belgium	55%	11%	71.5%	0	3.5%	0	7.6%	Yes 0.9%	2
DKV	Germany	0	22%	11%	35%	22%	9%	0	Yes	2
EFRIARC	Portugal	16%	0	0	71%	0	1%	12% *	Yes	2
FINVAC	Finland	18%	0	33%	0	36%	0	3% *	No	2
IOR UK	United Kingdom	1%	40%	20%	0	35%	3%	1%	Yes	3
ISHRAE	India	21%	70%	4%	0	0	0	0	Yes	2
JSRAE	Japan	8%	28%	26%	12%	25%	1%	0	Yes	2
KGH	Serbia	27%	2%	0	0	71%	0	0	Yes	1
LITES	Lithuania	0	89%	0	3%	0	8%	0	Yes	4
OEA	Lebanon	0	0	0	0	98%	0	0	No	1
PHVAC	Pakistan	20%	50%	0	25%	0	0	0	No	2
SAIRAC	South Africa	1%	6%	4%	0	81%	3%	5%	No	3
SAREK	Korea	1%	15%	14%	42%	27%	2%	0	Yes	2
SITHOK	Slovenia	35%	0	20%	0	35%	0	10%	Yes 10%	1
STP	Czech Repub	3%	0	42%	0	55%	0	0	Yes	2

Acronym	Country	Question #1 Energy Sources							Question #2	Question#3
		Hydro	Thermal Gas	Nuclear	Petro Oil	Coal	Wood Biomass	Import Other	Renewables Reimbursement	National Building Energy Benchmarks
SWEDVAC	Sweden	49%	12%	37%	0	0	0	2% *	No	2
SWKI	Switzerland	56%	5%	39%	0	0	0	0	Yes	2
TTMD	Turkey	19%	46%	0	5%	29%	0	0	Yes	1
TVVL	Netherlands	-	-	-	-	-	-	-	Yes	1

* = Wind Energy 1 No 2 Yes Res/Non Res 3 Non Res Only 4 Res Only

Survey Responses Questions 5-11

Acronym	Country	Question #5	Question #6	Question #7	Question #8	Question #9	Question #10	Question # 11
		Updates	Value	Metrics	Floor Area	Labeling	Improvements	Bldg Rating
AAF	Argentina	3 Months	Little	kWh/m ² -yr	1	3	2	Mj/m ² -yr
ABOK	Russia	Monthly	High	kWh/m ² -yr	3	3	2	kWh/m ² -yr
ABRAVA	Brazil	-	-	-	-	2	2	Mj/m ² -yr
ACAIRE	Columbia	4-5 Year	None	kWh/yr	4	3	2	kBtu/ft ² -yr
ACAIRE 2	Columbia	Not Known	-	-	-	2	2	kWh/m ² -yr
ACTECIR	Catalonia	-	Administrative	kWh/m ² -yr	2	1	2	CO ₂ e/yr
AGFR-AIIR	Romania	Annual	50-500 kWh/m ² -yr	kWh/m ² -yr kg CO ₂ e/m ² -yr	2	1	1 20%	kg CO ₂ e/m ² -yr
AHGWTEL	Latvia	Research	kWh/m ² -yr	kWh/m ² -yr	1	2	2	kWh/m ² -yr
AICARR	Italy	Annual	kWh/m ² -yr	kWh/m ² -yr	2	1	-	kWh/m ² -yr kWh/m ³ -yr
AICVF	France	Annual	Good	kWh/m ² -yr	2	1	1	Mj/m ² -yr
AMERIC	Mexico	Monthly	Good	MWh/m ² -yr	3	2	2	Watts
ASBRAV	Brazil	-	-	-	-	2	2	Mj/m ² -yr
ASHRAE	Canada	5 Year	Important	Gj/m ²	1	3	2 3%	Gj/m ² -yr
ASHRAE	USA	4 Year	Benchmarking	kBtu/ft ² -yr	1	2	2	CO ₂ e/yr
ASURVAC	Uruguay	-	-	-	-	3	-	-
ATEOYR	Spain	-	-	-	-	1	1 Design	CO ₂ e/yr
ATIC	Belgium	Annual	-	kWh/m ² -yr	2	1	2	kWh/m ² -yr
DKV	Germany	Periodic	kWh/m ² -yr	kWh/m ² -yr	1	1	1 Legislation	Mj/m ² -yr CO ₂ e/yr
EFRIARC	Portugal	None	Policy	Kg Oil/ft ²	4	1	1 General	Kg Oil/ ft ²
FINVAC	Finland	Annual	Statistics	GWH	4	1	1 More Class A	kWh/m ² -yr
IOR UK	United Kingdom	Annual	None	kWh/m ² -yr kg CO ₂ e/m ² -yr	2	1	2	kWh/m ² -yr kg CO ₂ e/yr
ISHRAE	India	None	kWh/m ² -yr	kWh/m ² -yr	2	2	2	kWh/m ² -yr
JSRAE	Japan	Annual	Policy	Mj/m ² -yr	1	2	2	Mj/m ² -yr
KGH	Serbia	-	-	-	-	3	-	-
LITES	Lithuania	Monthly	Good	kWh/m ² -yr	2	1	1 Energy Class	kWh/m ² -yr
OEA	Lebanon	-	-	-	-	3	2	kWh/m ² -yr
PHVAC	Pakistan	Annual	Policy	kWh/m ² -yr	3	4	3	-
SAIRAC	South Africa	New	Policy	kWh/m ² -yr	1	3	2	Mj/m ² -yr

Acronym	Country	Question #5	Question #6	Question #7	Question #8	Question #9	Question #10	Question # 11
		Updates	Value	Metrics	Floor Area	Labeling	Improvements	Bldg Rating
				Mtc Tons CO ₂ e				
SAREK	Korea	Annual	Source Energy	kWh -yr	4	1	1 Methods	kWh-yr kg CO ₂ e/m ² -yr
SITHOK	Slovenia	-	-	-	-	3	2	kWh/m ² -yr kWh/m ³ -yr
STP	Czech Repub	Annual	Statistics	kWh/m ² -yr	2	1	2	kWh/m ² -yr
SWEDVAC	Sweden	Annual	Widely	kWh/m ² -yr	2	2	2	kWh/m ² -yr
SWKI	Switzerland	Annual	Research	kWh/m ² -yr kg CO ₂ e/m ² -yr	2	2	1	kWh/m ² -yr kg CO ₂ e/m ² -yr
TTMD	Turkey	-	-	-	-	1	2	KWH/Yr
TVVL	Netherland	-	-	-	-	1	1 Value	Mj/m ² -yr kg CO ₂ e/m ² -yr

- | | | |
|-----------------------|----------------------|--------------|
| 1. Bldg Gross Area | 1. Current Mandatory | 1. Yes Data |
| 2. Bldg Cond. Area | 2. Current Voluntary | 2. Too Early |
| 3. Bldg Area Not Used | 3. Considered | 3. No |
| 4. Other | 4. Not Planned | |

Survey Responses Questions 12-17

Acronym	Country	Question #12	Question #13	Question #14	Question #15	Question #16	Question #17
		Labeling	Certification	Normalization	Certified	Software	Building Types
AAF	Argentina	NA	3 NA	3 NA	2	2	NA
ABOK	Russia	http://minenergo.gov.ru/ http://www.minregion.ru/ http://www.mos	1	1	1	1	See List
ABRAVA	Brazil	www.procel.gov.br	1	1	2	2	5 Steps ABCDE
ACAIRE	Columbia	NA	3NA	3 No	2	2	LEED
ACAIRE 2	Columbia	www.cccs.org.co	1	2	1 LEED	2	Study
ACTECIR	Catalonia	www.actecir.cat	3	3	2	1	All
AGFR-AIIR	Romania	http://instalatii.utcb.ro	3	1	2	1	Most
AHGWTEL	Latvia	www.malkalne.lv www.lsgutic.lv	1	2	1	1	Limited
AICARR	Italy	www.region.lombardie.it/ambiente	2	3	2	1	All
AICVF	France	www.ademe.fr	3	1	1	1	Most
AMERIC	Mexico	www.conuee.gob.mx www.ema.org.mx	1	2	1	1	Non Residential
ASBRAV	Brazil	http://www.aneel.gov.br/idiomaAtualcl	1	1	1	2	-
ASHRAE	Canada	NA	2	2	2 PE	2 Energy Star	Schools and Offices
ASHRAE	USA	www.energystar.gov/index.cfm?c=business.bus_bldgsEPA	2	2	1	1	Most
ASURVAC	Uruguay	-	-	-	1	-	-
ATEOYR	Spain	www.mityc.es/energia/desarrollo/eficiencia/Certificatioenergetica/normativa/pajinas/rd47_2007.aspx	1	1	1	1	See List
ATIC	Belgium	http://energie.wallonie.be/fr/appliquen-1a-regimentation-wallonne.html?IDC=6148	3	3	1	1	Most
DKV	Germany	www.dena.de/en.?0	3	3	1	1	See List
EFRIARC	Portugal	See Report	2	3	1	1	Most
FINVAC	Finland	EN 13790 www.fise.fi	1	2	1	2	All
IOR UK	United Kingdom	www.communities.gov.uk	1	3	1	1	See List
ISHRAE	India	www.bee-india.nic.in/	1	1	1	1	See List
JSRAE	Japan	www.ibec.or.jp/CASBEE/english/index.htm	3	3	1	2	Houses/Renovation
KGH	Serbia	-	-	-	-	-	-
LITES	Lithuania	www3.Irs.it/pls/inter3/dokpa.eska.dok_prie_des_pdf?p_id=15689	1	1	1	1	All

OEA	Lebanon	-	1	1	1	1	Commercial
PHVAC	Pakistan	-	3	3 NA	2 NA	2 NA	NA
SAIRAC	South Africa	In Process www.gbcsa.org.za	1	3	1	1	Commercial
SAREK	Korea	www.kemco.or.kr/	2	2	2	1	Apartments/Offices
SITHOK	Slovenia	www.mg.gov.si/en	3	3	1	2	EPBD
STP	Czech Repub	www.mpo.cz/en/energy-rawmaterials/energyefficiency/	1	3	1	2	Most
SWEDVAC	Sweden	www.boverket.se	1	2	1	2	All
SWKI	Switzerland	http://www.minergie.ch/home_en.html	3	1	1	1	See List
TTMD	Turkey	-	1	3	1	1	All
TVVL	Netherland	See Report	3	3	1	1	Most

1 Site	1 Schedule	1 Yes	1 Yes
2 Source	2 Weather	2 No	2 No
3 Other	3. Other		

APPENDIX D - LIST OF BUILDING ENERGY RATING AND PERFORMANCE PROGRAMS

Information is available on the Building Rating Organization web site <http://buildingrating.org/> on building energy rating and performance programs available around the globe. The organizations mailing address is:

1776 Massachusetts Ave NW, Suite 815
 Washington DC 20036
 Tel. (202) 525-2883 Email info@buildingrating.org

© BuildingRating.org All Rights Reserved. Read our [Copyright and Permission requests information](#). The site provides dynamic access to each country's data energy labels, certificates, and scorecards currently in use or development

Energy Label Gallery

AUSTRALIA

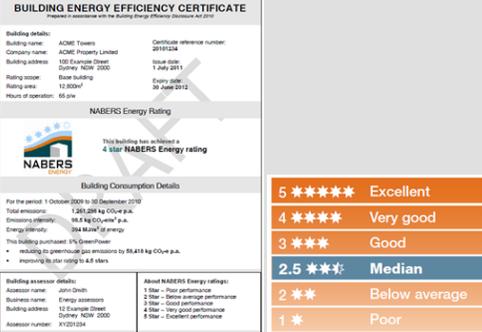
ACThers	NABERS												
 <p>ACThers House Energy Rating YOUR HOUSE ENERGY RATING IS: 4 STARS SCORE: 38 POINTS Address: 14 Tarranville Road, ACT 2600 Assessor: C. PETERSON/PLS/RESIDENTIAL/ACTELFORED 3881</p>	 <p>BUILDING ENERGY EFFICIENCY CERTIFICATE <small>Issued in accordance with the Building Energy Efficiency Certificate Act 2010</small></p> <p>Building details: Building name: ACME Towers Certificate reference number: 20101234 Company name: ACME Property Limited Building address: 100 Example Street Issue date: 7 May 2011 City/State: Sydney, NSW 2000 Rating scale: 5 Star Building Rating mark: 12.00000 Expiry date: 28 June 2012 Hours of operation: 65.0hr</p> <p>NABERS Energy Rating This building has achieved a 4 star NABERS Energy rating</p> <p>Building Consumption Details For the period 1 October 2009 to 30 September 2010 Total emissions: 1,263,208 kg CO₂e p.a. Emissions intensity: 99.4 kg CO₂e/m² p.a. Energy efficiency: 106.4 MJ/m² of energy This building purchased 0% GreenPower including its greenhouse gas emissions by 99.414 kg CO₂e p.a. + improving its own energy to 4.8 stars</p> <p>Building assessor details: Assessor name: John Smith Business name: Energy assessors Building address: 12 Example Street City/State: Sydney, NSW 2000 Assessor number: 910201234</p> <p>about NABERS Energy ratings: 5 Star - Best performance 4 Star - Good performance 3 Star - Good average performance 2 Star - Fair performance 1 Star - Poor performance 0 Star - Excellent performance</p> <table border="1"> <tr><td>5 ★★★★★</td><td>Excellent</td></tr> <tr><td>4 ★★★★★</td><td>Very good</td></tr> <tr><td>3 ★★★★★</td><td>Good</td></tr> <tr><td>2.5 ★★★★★</td><td>Median</td></tr> <tr><td>2 ★★★★★</td><td>Below average</td></tr> <tr><td>1 ★★★★★</td><td>Poor</td></tr> </table>	5 ★★★★★	Excellent	4 ★★★★★	Very good	3 ★★★★★	Good	2.5 ★★★★★	Median	2 ★★★★★	Below average	1 ★★★★★	Poor
5 ★★★★★	Excellent												
4 ★★★★★	Very good												
3 ★★★★★	Good												
2.5 ★★★★★	Median												
2 ★★★★★	Below average												
1 ★★★★★	Poor												

Image Sources: http://www.propertyoz.com.au/library/DCCEE_commercialBuildingDisclosure_presentation_sep2010.pdf;

ASIA

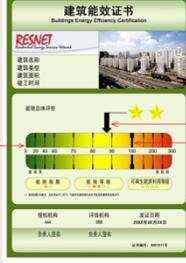
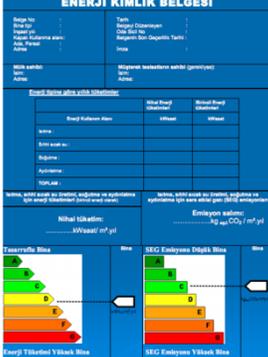
China	China (Shanghai)	Tokyo	Turkey
 <p>Building energy rating certificate from China, showing a green 'E' rating and detailed energy performance metrics.</p>	 <p>Building Energy Rating Certificate from Shanghai (RESNET), featuring a color-coded energy efficiency scale from red to green.</p>	 <p>Building Energy Performance Certificate from Tokyo, showing a detailed energy audit report with a color-coded performance scale.</p>	 <p>ENERJI KİMLİK BELGESİ (Energy Identity Certificate) from Turkey, including a building energy audit report and a color-coded energy efficiency scale.</p>
Turkey			
 <p>Detailed view of the Turkey Energy Identity Certificate, showing the 'ENERJI KİMLİK BELGESİ' header and various energy performance indicators.</p>			

Image Sources: Comparative Analysis of U.S. and China Building Energy Rating and Labeling Systems. Mo et. al. 2010; Tokyo Climate Change Strategy: Progress Report and Future Vision. Tokyo Metropolitan Government. 2010; http://www.yapi.com.tr/Sektorden/kimligi-olmayan-ev-satilmasin_85430.html; <http://www.direnenerji.com/en/applications/energy-identity-certification/>

BRAZIL

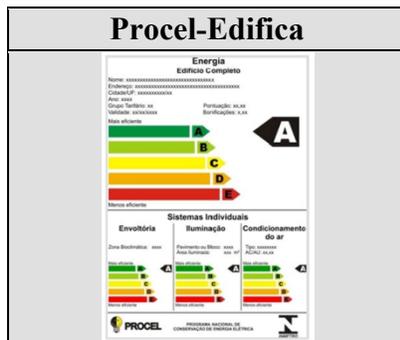


Image Source: <http://www.inmetro.gov.br/qualidade/eficiencia.asp>

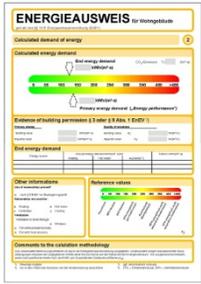
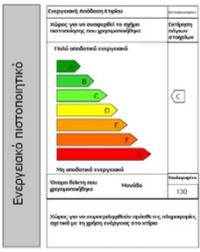
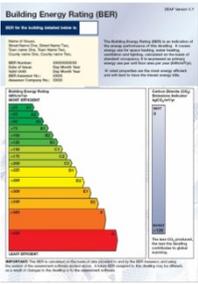
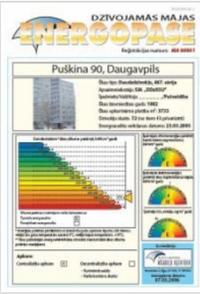
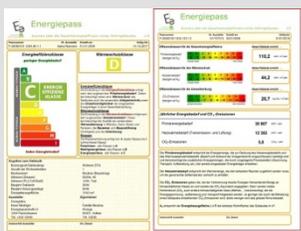
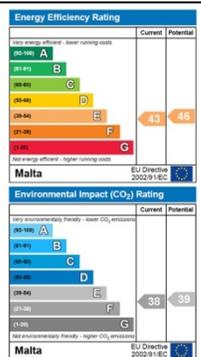
CANADA

E-Scale	EnerGuide

Image Sources: http://www.cresnet.ca/home/2009_AGM_Agenda/herscan; <http://www.crebogreen.com/>

EUROPEAN UNION

Austria	Belgium - Brussels Capital Region	Belgium - Flanders Region	Belgium - Walloon Region
Bulgaria	Croatia	Cyprus	Czech Republic

<p style="text-align: center;">Denmark</p> 	<p style="text-align: center;">Estonia</p> 	<p style="text-align: center;">Finland</p> 	<p style="text-align: center;">France</p> 
<p style="text-align: center;">Germany</p> 	<p style="text-align: center;">Greece</p> 	<p style="text-align: center;">Hungary</p> 	<p style="text-align: center;">Ireland</p> 
<p style="text-align: center;">Italy</p> 	<p style="text-align: center;">Latvia</p> 	<p style="text-align: center;">Lithuania</p> 	<p style="text-align: center;">Luxembourg</p> 
<p style="text-align: center;">Malta</p> 	<p style="text-align: center;">Netherlands</p> 	<p style="text-align: center;">Norway</p> 	<p style="text-align: center;">Poland</p> 

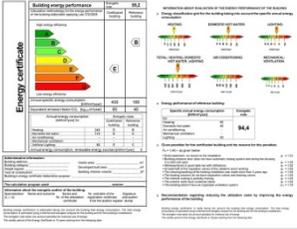
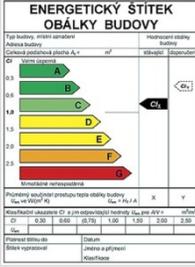
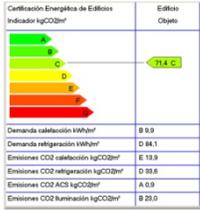
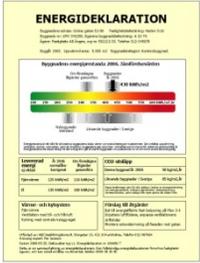
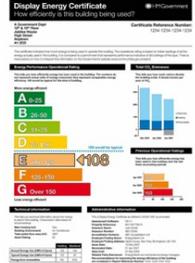
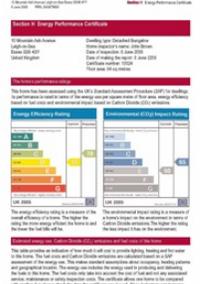
Portugal	Romania	Slovak Republic	Slovenia
 <p>Portugal Energy Certificate showing a color-coded scale from A (green) to G (red) and a table of energy performance indicators.</p>	 <p>Romania Energy Certificate with a color-coded scale and detailed technical specifications for building energy performance.</p>	 <p>Slovak Republic Energy Certificate (ENERGETICKÝ ŠTÍTEK OBÁLKY BUDOVY) featuring a color-coded scale and energy consumption data.</p>	 <p>Slovenia Energy Certificate (ENERGETSKA IZKAZNICA STAVBE) with a color-coded scale and building energy performance metrics.</p>
Spain	Sweden	United Kingdom (DEC)	United Kingdom (EPC)
 <p>Spain Energy Certificate (Certificación Energética de Edificios) showing a color-coded scale and a table of energy performance indicators.</p>	 <p>Sweden Energy Certificate (ENERGIDEKLARATION) with a color-coded scale and energy performance data.</p>	 <p>United Kingdom (DEC) Display Energy Certificate showing a color-coded scale and energy performance metrics.</p>	 <p>United Kingdom (EPC) Energy Performance Certificate showing a color-coded scale and energy performance data.</p>

Image Sources: "Implementation of the Energy Performance of Buildings Directive: Country Reports 2008," *EPBD Buildings Platform*. Concerted Action EPBD, 2008; *How will energy certificates look across Europe?* EPLabel, June 2006; <http://www.kulde.biz/>; http://www.hotproperty.com.mt/malta_property_energy_performance_certificates.aspx; Energy Labelling of Buildings: Existing Experience with Certification of Buildings in Denmark. Jens Laustsen, 29 Nov. 2005; http://epiciranje.blogspot.com/2010_09_15_archive.html.

UNITED STATES

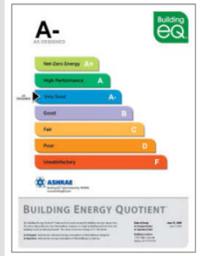
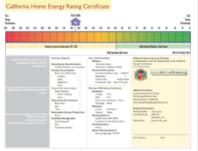
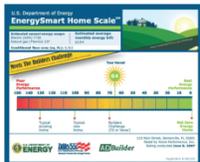
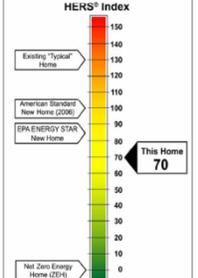
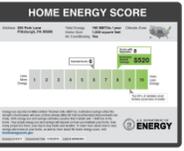
Building Energy Quotient (BEQ)	California Energy Performance Disclosure (proposed)	California Home Energy Rating Certificate (proposed)	Energy Performance Score
			
Energy Smart	ENERGY STAR Statement of Energy Performance	HERS Index	Home Energy Rating Certificate
			
Home Energy Score			
			

Image Sources:

<http://www.automatedbuildings.com/news/nov09/articles/smartbldgs/091029124404smartbldgs.htm><http://greenspringmanor.com/builders-challenge.html>, <http://airadvice.com/buildingblog/wp-content/uploads/2009/06/building-energy-quotient-label.jpg>, http://hammerandhand.com/blog/Field_Notes/post/A_wish_for_2011_an_MPG-like_rating_for_all_homes_on_the_market_in_Oregon/, <http://ab1103.wordpress.com/>, Richard Fasey, Energy Futures Group. Presentation: "Building energy labeling & disclosure overview," *Regulatory Assistance Project Webinar*. January 13, 2011.