M I N U T E S

EXECUTIVE COMMITTEE MEETING

Hyatt Regency Hotel Long Beach
Long Beach, California
June 24 and 28, 2017

Note: These draft minutes have not been approved and are not the official, approved record until approved by the Executive Committee.

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Executive Committee Meeting
June 24 and 28, 2017

PRINCIPAL MOTIONS

Executive Committee Meeting
June 24 and 28, 2017

No. - Pg.	Motion
1 – 3	that ExCom recommends that the IEQ-GA/ASHRAE Memorandum of Understanding be approved and sent to the Board of Directors.
2 – 4	that a consent motion to recommend all Public Policy Issue Briefs for Society 2017- 2018 be approved: • Building Energy Data: A Critical Resource • Climate Change and Building Energy Efficiency • Commercial Building Energy Use • Consensus Standards: Expert Solutions to Meet Global Needs • Energy Efficiency for Buildings and HVAC&R Equipment • Energy Use Metrics and Targets for Commercial Buildings • Research and Development Needs to Meet National Goals • Science, Technology, Engineering and Mathematics Education
3 – 4	that ExCom recommends that the Pakistan HVAC&R/ASHRAE Memorandum of Understanding be approved by the Board of Directors.
4 – 5	that ExCom recommends that the REHVA/ASHRAE Memorandum of Understanding be approved by the Board of Directors.
5 – 6	that the ASHRAE Board of Directors approve changing the name of the “ASHRAE Foundation Learning Center” to the “Carolyn and Damon Gowan Learning Center.”(See Attachment J.)
6 – 6	that the ASHRAE Board of Directors approve the Ottawa Valley Scholarship as proposed in the attached signed endowed gift agreement between ASHRAE’s Ottawa Valley Chapter and ASHRAE Foundation with criteria listed in the Purpose section of the agreement. (See Attachment J.)

ACTION ITEMS
Executive Committee Meeting
June 24 and 28, 2017

Item	Responsible	Summary of Action	Status
1 – 2	Olesen/Littleton	(Carryover) Investigate the cost for membership in INIVE which would include participation by all ASHRAE members. **(Update:** 10/2016 - $6,000 all ASHRAE members in N.A., $1500 for all U.S. members. 1/2017: Ongoing. 3/2017: Ongoing. **6/2017: Ongoing.**)	_____
2 – 2	Littleton	(Carryover) Reapply as a partner to CCAC, instead of as an actor. **(Update**: 1/2017 – Ongoing. 3/2017: Ongoing**. 6/2017: Ongoing.**)	_____
3 – 2	Olesen	(Carryover) Decide on who we should ask to be the flammability expert speaker at the event in July and contact them by mid- April, to see if they can attend the July meeting. **(Update: 6/2017: Ongoing.)**	_____
4 – 2	Littleton	(Carryover) Work with staff and Mr. Wentz to produce a new antitrust electronic training module. **(Update: 6/2017: Ongoing.)**	_____
5 – 2	Tsui	(Carryover) Notify PubEd of the location of the Professional Practice Guidelines. (*Secretary's Note: This is in reference to an original action item "Work with PubEd and GGAC for the appropriate location to place the Guidelines for* Professional Practice in the ASHRAE structure. **(Update**: 10/2016 - Ongoing. **6/2017: Ongoing**.)	
6 – 2	Hayter	(Carryover) Explore the engagement between policy makers and technical professionals with regard to climate issues once the Washington D.C. office is fully staffed. **(Update: 6/2017: Ongoing.)**	_____
7 –	Littleton	(Carryover) Update the Executive Committee Reference Manual with appropriate staff changes. **(Update: 6/2017: Ongoing.)**	_____
8 – 2	Olesen	(Carryover) Notify Members Council about the effort to encourage student members to become members of other international societies. **(Update: 6/2017: Ongoing.)**	_____
9 – 2	Boyce	Request that the three council identify their 5 least impactful programs/initiatives with coordination and input from Finance and Planning committees. Reports due by the Winter Meeting in Council reports. (Secretary's Note: Recognizing that some of our programs are specifically designed to be member benefits and not profitable.)	
10 – 3	Olesen	Propose the DRC forum developing ways to budget the 25K set aside for special insurance for regional and chapter contact sports, shooting events and water sports events and the process for application for financial assistance support.	_____

Item	Responsible	Summary of Action	Status
11 – 3	Olesen	Notify CLIMA 2019 that they will be reporting to CEC this Society year and not the Executive Committee.	
12 – 4	Boyce	Work with the Finance Committee on an alternative way to determine membership dues besides the CPI.	
13 – 4	Scoggins	Give direction to the IAST MTG to create a Research Topic Acceptance Request (RTAR). (Secretary's Note: MTG formed as part of the Strategic Plan –Initiative 1B)	
14 – 5	Littleton	Check with legal counsel if Cuba can be a member of AASA and also any approved funding opportunities for Cuba by ASHRAE or its partners.	
15 – 5	Littleton	Explore marketing options going forward since the U. S. withdrawal from the Paris Agreement. (Examples: international mayors, GGAC, National Association of State Energy Officials.)	
16 – 5	Olesen	Provide ethics complaint report to the Board in the future at the Annual Meeting.	
17 – 6	Littleton	Investigate membership into Global Alliance Buildings. (GABC)	
18 – 7	Littleton	Review CEC schedule of Annual and Winter meetings and determine whether they are scheduled and/or conflict with Ramadan.	

Hyatt Regency Hotel Long Beach
Long Beach, California
June 24 and 28, 2017

EXECUTIVE COMMITTEE MEETING

MEMBERS PRESENT:	Timothy G. Wentz, President Bjarne W. Olesen, President-Elect Sheila J. Hayter, Treasurer Walid Chakroun, Vice President Patricia T. Graef, Vice President M. Ginger Scoggins, Vice President Edward Ka Cheung Tsui, Vice President
MEMBER NOMINEES PRESENT:	Darryl K. Boyce, Treasurer Nominee Julia A. Keen, Vice President Nominee Mick CA Schwedler, Vice President Nominee

GUESTS: June 24, 2017

Jack Zarour	Don Brandt
Joe Chin	James Allick
Tim McGinn	Akshay Bharjava
Jon Symko	Trent Hunt
Tiffany Biagini	Larry Markel
Marites Calad	Costas Balaras
Dick Hayter	

GUESTS: June 28, 2017

Peter Simmonds	Doug Cochrane
Don Brandt	Joe Chin
Tiffany Biagini	James Gallick
Chuck Curlin	

STAFF PRESENT:

Jeff H. Littleton, Executive Vice President
Mary D. Townsend, Executive Assistant
Joyce Abrams, Director of Member Services (6/24)
Steve Comstock, Director of Publications and Education (6/24)
Vanita Gupta, Director of Marketing (6/24 and 28)
Kim Mitchell, Chief Development Officer (6/24 and 28)
Craig Wright, Director of Administrative Services (6/24 and 28)
Alice Yates, Director of Government Affairs (6/24)
Nicole Blount, Sr. Mgr. of Development/Planned Gifts (6/24 and 28)
Mark Owen, Editor/Group Mgr. – Handbook (6/24)
Lilas Pratt, Manager – Special Projects (6/24 and 28)
Jim Scarborough, Mgr. - Grassroots Government Activities (6/28)

Call to Order

President Wentz called the first of two Executive Committee meetings to order on Wednesday, June 24, 2017 at 8:30 a.m. ExCom members, nominees, guests and staff attended as listed above.

Review of the Agenda

The following item was added to the agenda.

- Global Alliance Buildings – Tsui

Approval of Minutes

Ms. Chakroun moved:

> that the minutes from the Executive Committee Meetings in Santa Barbara, California, March 23 - 25, 2017 be approved.

MOTION PASSED (Unanimous, CNV)

Review of Action Items

Action items 1-8 are ongoing and listed in the action item list at the beginning of the minutes. Updates are included where possible. AI 1-8

Report of the Treasurer Attachment A

Ms. Hayter reported that her report to ExCom would be give a quick overview of the presentation that will be given to the Board at the Sunday meeting. The financial reports and other budget information was forwarded to the Board of Directors ahead of time to allow them the opportunity to review the material and to ask questions before the meeting.

The following would be the major points of the presentation:

- ASHRAE's current operating results through May 2017. The forecasted deficit for FY 16-17 is currently $67K vs. the budgeted deficit of $283K.
- The forecasted budgeted deficit for FY 17-18 is $301K.
- A status overview of President Wentz initiatives for this past year and a look ahead at President-Elect Olesen's initiatives.
- Presentation of the six motions from the Finance Committee to the Board of Directors.

Mr. Boyce will request that the three council identify their 5 least impactful programs/initiatives with coordination and input from Finance and Planning committees. Reports due by the Winter Meeting in Council reports. (Secretary's Note: Recognizing that some of our programs are specifically designed to be member benefits and not profitable.) AI-9

Ms. Hayter reviewed the Chapter Special Events Insurance and its importance in protecting the Society (in the United States and Canada). This budget is a continuing effort to assist chapters that aren't getting the required insurance policy for particular events and providing funding opportunities so that these events are covered.

Mr. Olesen will propose to the DRC Forum developing ways to budget the 25K set aside for special insurance for regional and chapter contact sports, shooting events and water sports events and the process for application for financial assistance support. AI-10

Executive Session

The Executive Committee had several sessions during the two-day meeting and all discussions are covered in the Executive Session minutes.

Committee Reports

Advanced Energy Design Guide (AEDG) Attachment B

Ms. Graef reported that the AEDG distribution is up (see attachment). The development of the AEDG for K-12 Buildings: Achieving Zero Energy Building is nearing completion. The project is on schedule for publication in October – November 2017. A seminar on the K-12 ZEB guide was presented in Orlando at the AIA annual convention. The 50% AEDG Recommendation Tables were added to the AEDG free download web pages and discussion continues on how to market their existence. A survey was sent out in May 2017 to past downloaders and there were 2800 responses and the results will be reviewed by the committee during the Long Beach meeting.

CLIMA 2019

Mr. Olesen reported that the CLIMA 2019 committee has been established and will meet soon. The committee will discontinue reporting to ExCom and report to CEC.

Mr. Olesen will notify CLIMA 2019 that they will be reporting to CEC this Society year and not the Executive Committee. AI - 11

NIBS/NCEES

Mr. Hayter reported that each state sets its own licensing but NCEES tries to coordinate some reciprocity between states. The current challenis the action by Civil Engineers who want an advanced degree to be certfiied and ASHRAE is opposing the requirement. NSPE has recently changed its position to be against an advanced degree for certification.

Unfinished Business

IEQ-GA MOU Draft – Track Changes Attachment C

Mr. Olesen moved:

(1) that ExCom recommends that the IEQ-GA/ASHRAE Memorandum of Understanding be approved and sent to the Board of Directors.

MOTION 1 PASSED (Unanimous, CNV)

Dues Increase Policy

Ms. Hayter reported that the dues increase policy has been discussed by the Finance Committee and that the CPI, which is used to determine ASHRAE membership dues, is not keeping up with the cost to operate the organization. Currently, the other large source of income for ASHRAE comes from the EXPO, but this may not always be true and alternative ways to determine dues be considered.

Mr. Boyce will work with the Finance Committee on an alternative way to determine membership dues besides the CPI. AI - 12

IAST.MTG Focus

Ms. Scoggins reported that a MTG was formed as part of the ASHRAE Strategic Plan – Initiative 1B. The group has struggled with understanding the focus of the MTG and the best way to address the intiative. This originally was part of an ad hoc whose final recommdation was an MTG be formed. One of the focuses for the MTG was to market the good things that have been accomplished.

Ms. Scoggins will give direction to the IAST MTG to create a Research Topic Acceptance Request (RTAR). (Secretary's Note: MTG formed as part of the Strategic Plan –Initiative 1B.) AI - 13

New Business

Review of Public Policy Issue Briefs Attachment D

Ms. Scoggins moved:

(1) that a consent motion to recommend all Public Policy Issue Briefs for Society 2017-2018 be approved:
- Building Energy Data: A Critical Resource
- Climate Change and Building Energy Efficiency
- Commercial Building Energy Use
- Consensus Standards: Expert Solutions to Meet Global Needs
- Energy Efficiency for Buildings and HVAC&R Equipment
- Energy Use Metrics and Targets for Commercial Buildings
- Research and Development Needs to Meet National Goals
- Science, Technology, Engineering and Mathematics Education

MOTION 2 PASSED (Unanimous, CNV)

Pakistan HVAC&R MOU Attachment E

Mr. Tsui moved:

(3) that ExCom recommends that the Pakistan HVAC&R/ASHRAE Memorandum of Understanding be approved by the Board of Directors.

MOTION 3 PASSED (Unanimous, CNV)

ASHRAE/REHVA MOU Attachment F

Mr. Chakroun moved:

(4) that ExCom recommends that the REHVA/ASHRAE Memorandum of Understanding be approved by the Board of Directors.

MOTION 4 PASSED (Unanimous, CNV)

Options to Serve Cuba Attachment G

Mr. Olesen reported that while he was in Cuba he visited the university and also met with several engineering societies. In Santiago he met with engineers that expressed interest to be invited to the Associate Society Alliance meeting in April. We need to better understand the details of working with Cuba.

Mr. Littleton will check with legal counsel if Cuba can be a member of AASA and also any approved funding opportunities for Cuba by ASHRAE or its partners. AI - 14

Marketing Options Going Forward – U.S. withdrawal from Paris Agreement

Mr. Wentz reported that he sent an open letter to ASHRAE membership re-enforcing its commitment to creating a sustainable environment. The letter was well received with only 35 negative emails sent to him. One of the issues to consider is whether there is an opportunity for ASHRAE to expand its influence and its membership in light of the U.S. withdrawal from the Paris Agreement.

Comments included:

- An awareness campaign about what ASHRAE does and ways to help the membership understand the total mission of ASHRAE.
- Caution to be as non-political as possible.
- Impact this decision has on other agreements coming forward that will require U.S. signature.
- Opportunity for GGAC to approach those that may be helpful.

Mr. Littleton will explore marketing options going forward since the U. S. withdrawal from the Paris Agreement. (Examples: international mayors, GGAC, National Association of State Energy Officials.) AI - 15

Ethics Complaint Report to the Board Attachment H

Mr. Wentz reported that there was a request by the Board to have ExCom submit an Ethics Complaint Report to the Board during each Society year. Attached is the Annual Report to the Board of the ASHRAE Code of Ethics and Discrimination & Harassment Policy Complaints. The report will be submitted to the Board of Directors each Annual and winter Meeting.

Mr. Olesen will provide an Ethics Complaint Report to the Board in the future at the Annual and winter Meeting 2018. AI - 16

Appointing a “Hywel Davies” Equivalent to CIBSE

Mr. Wentz reported that ASHRAE would benefit from a person that knows CIBSE well and can convey that clearly to ASHRAE. At the current time, Hywel Davies is the equivalent of this for CIBSE. He

knows ASHRAE and how it works and can convey that to CIBSE. This individual might be a volunteer or a staff person who might serve on the CIBSE Knowledge Management Committee. The representative could provide knowledge and networking within CIBSE, identify synergies and assist with technology engagement. Mr. Olesen will work towards providing an individual as described when he makes a decision on an ASHRAE staff person in Europe.

Global Alliance Buildings Attachment I

Mr. Tsui reported that the Global Alliance Building Committee was launched by the Paris Agreement. It was initiated by France and the United Nations Environment Programme (UN Environment) to bring together the building and construction industry, countries and stakeholders to raise awareness and facilitate the global transition towards for low-emission, energy-efficient buildings.

Mr. Littleton will investigate membership into Global Alliance Buildings. AI - 17

Reports from other Reporting Bodies

President-Elect Advisory Committee

Ms. Hayter reported a quick overview of the brainstorming presidential theme session during the PEAC meeting conducted by Hugh Crowther.

Foundation Trustees Attachment J

Ms. Graf moved:

(5) that the ASHRAE Board of Directors approve changing the name of the "ASHRAE Foundation Learning Center" to the "Carolyn and Damon Gowan Learning Center."(See Attachment J.)

MOTION 5 PASSED (Unanimous, CNV)

Scholarship Trustees Attachment K

Mr. Tsui moved:

(6) that the ASHRAE Board of Directors approve the Ottawa Valley Scholarship as proposed in the attached signed endowed gift agreement between ASHRAE's Ottawa Valley Chapter and ASHRAE Foundation with criteria listed in the Purpose section of the agreement. (See Attachment K.)

MOTION 6 PASSED (Unanmous, CNV)

College of Fellows/Life Members Attachment L and M

Mr. Simmonds reported the following items from the College of Fellows meeting:

- The College of Fellows supports the relationship between ASHRAE and AIA and would like to encourage Board ExCom to become more involved with AIA. See the attached document showing the support from the Fellows.
- The mentoring provided by the COF for YEA has not been the success they had hoped with only 51 YEA members signing up. Efforts will continue.

- The COF and Honors and Awards have agreed to have two Fellows involved in reviewing Fellow nominations.

Ms. Mitchell reported the following items from the Life Members meeting:

- Year to date giving is up from this time last year.
- The Life Member's Club will have Dick Wittkop speak at the Life Member's Luncheon. He will be talking about the Port of Long Beach.
- The Life Member's Executive Committee discussed ideas for reaching out to Life Members outside of the US and Canada.

Joint Expo Policy Committee Attachment N

Mr. Littleton reported the following from the Joint Expo Policy Committee meeting:

- A final attendance report of the 2017 AHR Expo in Las Vegas reveals several new all-time records for the show, including 500,159 net square footage of exhibit space.
- A comparison of ASHRAE Winter Conference registrations from 2008 to 2017 reveal higher attendance rates when the AHR Expo is held in Las Vegas as compared to other cities.
- The committee discussed the future direction of the AHR Expo. Concerns are based the limited number of cities that have enough space to support the growth of the show in square footage. It was the consensus of the committee that quality of the show and value to its exhibitors and visitors is more important than increasing size of the show to more than 550,000 square feet in the foreseeable future.

Mr. Littleton will review the CEC schedule of Annual and Winter meetings and determine whether they are scheduled and/or conflict during Ramadan. AI - 18

INFORMATION ITEMS

NATE Report Attachment O

Report of the President Attachment P

Adjournment

Mr. Wentz thanked everyone for attending. The meetings was adjourned on Wednesday, June 28, 2017

Jeff H. Littleton, Secretary

mdt/2017-07-25

Distribution: Board of Directors
Staff Directors

Attachments: A. Report of the Treasurer
B. Advanced Energy Design Guide Report

C. IEQ-GA/ASHRAE Memorandum of Understanding
D. Public Policy Issue Briefs
E. Pakistan HVAC&R/ASHRAE Memorandum of Understanding
F. REHVA/ASHRAE Memorandum of Understanding
G. Olesen – Travel Report May and June
H. Ethics Complaint Report to the Board
I. Global Alliance Buildings
J. Foundation Trustees Report
K. Scholarship Trustees Report
L. College of Fellows Report
M. Life Members Report
N. Joint Expo Policy Report
O. NATE Report
P. Report of the President

ASHRAE
ASHRAE CONSOLIDATED (excl Foundation)
Statement of Revenues and Expenses
For the Eleven Months Ending Wednesday, May 31, 2017

Attachment A-1
ExCom Minutes: 2017 June 24 and 28

Fiscal YTD Through Month of May					TWELVE MONTHS ENDING JUNE 30						DRAFT	DRAFT	DRAFT
Actual	Budget	Actual	Budget		Actual	Actual	Budget	Actual	Forecast	Budget	Budget	Budget	Budget
FY 2016	FY 2016	FY 2017	FY 2017	acct / Description	FY 2014	FY 2015	FY 2016	FY 2016	FY 2017	FY 2017	FY 2018	FY 2019	FY 2020
				REVENUES									
$6,989.9	$7,086.9	$7,013.8	$7,311.9	31 Membership Dues Earned Income	$7,325.3	$7,430.5	$7,750.2	$7,634.5	$7,706.4	$7,985.4	$7,889.0	$8,050.8	$8,201.3
3,324.9	3,489.9	3,139.1	3,565.4	32 Publication Sales Income	3,803.6	3,483.9	3,585.5	3,626.1	3,528.8	3,924.8	3,700.1	3,855.6	3,942.8
3,555.3	3,475.1	3,324.3	3,610.2	34 Advertising Income - Display	3,773.1	3,710.8	3,761.0	3,779.4	3,613.1	3,846.0	3,658.2	3,824.9	3,985.5
17.6	24.0	16.9	22.8	34 Advertising Income - Classified	26.5	32.0	25.0	19.3	18.0	25.0	25.0	25.5	25.7
638.6	576.2	758.2	654.5	34 Advertising Income - On-line	470.4	595.6	640.0	715.8	845.0	720.0	870.0	895.0	920.0
1,020.0	1,100.7	1,557.0	1,340.1	35.1 Meeting & Seminar Income	1,965.7	1,578.5	1,737.5	1,529.9	2,206.6	1,968.5	1,889.3	1,679.4	1,695.3
163.9	205.6	181.4	218.4	35.2 Certification Registration	148.5	183.3	220.0	187.6	210.0	250.0	220.0	220.0	230.0
1,659.2	1,392.6	1,414.0	1,832.6	35.3 Education Registration	1,301.6	1,504.5	1,585.0	1,844.8	1,610.0	2,060.0	1,955.0	2,215.0	2,306.5
3.2		14.3		37 Special Project Income	105.0	316.6		3.2	45.0		50.0		
1,426.8	1,300.5	1,374.9	1,448.9	38 Contribution Income	1,945.6	2,116.6	2,249.4	2,215.6	2,360.8	2,335.8	2,440.8	2,489.4	2,539.2
5,168.0	4,757.6	5,623.7	5,168.0	41.1 AHR Exposition Income	3,973.0	5,146.6	4,757.6	5,168.0	5,624.0	5,168.0	5,802.5	4,800.0	5,168.0
57.0	59.4	100.0	140.9	41.2 Contributions and Matching Gifts	130.0	115.0	59.4	57.0	137.3	140.9	49.5	49.5	49.7
34.0	60.0	162.3	84.0	41.3 Exposition Income - Other Countries		145.9	60.0	34.0	162.3	84.0		50.0	
600.7	641.4	568.3	2,080.3	44 Reserve Transfers	1,025.5	885.7	641.4	655.3	989.7	2,269.4	1,768.7	948.4	976.8
305.0	285.6	284.4	322.6	46 Miscellaneous Income	340.7	534.4	299.1	322.7	377.0	352.9	548.4	533.4	494.9
24,964.1	**24,455.5**	**25,532.6**	**27,800.6**	**TOTAL REVENUES**	**26,334.5**	**27,779.9**	**27,371.1**	**27,793.2**	**29,434.0**	**31,130.7**	**30,866.5**	**29,636.9**	**30,535.7**
				EXPENSES:									
7,980.0	8,387.1	8,113.2	8,074.6	51 Salary Expense	7,523.6	7,910.9	8,403.1	8,780.7	8,822.0	8,891.9	9,360.6	9,722.9	9,997.9
2,377.3	2,370.0	2,397.2	2,404.9	52 Payroll Taxes, Benefits, Personnel Exp	2,271.7	2,536.2	2,392.2	2,738.8	2,633.2	2,654.7	2,822.1	2,894.9	3,087.2
3,235.6	3,591.8	2,876.5	3,473.3	61 Publishing and Promotion Expense	3,569.1	3,776.9	3,777.2	3,827.9	3,597.1	3,935.8	3,588.5	3,597.7	3,780.0
1,710.8	2,124.9	1,933.4	2,087.4	64 Meetings & Conferences Expense	2,293.1	2,199.2	2,279.1	2,362.8	2,639.2	2,786.2	2,692.7	2,355.4	2,420.5
1,544.6	2,201.9	1,822.0	2,172.5	66 Travel Expense	2,265.6	2,076.6	2,321.5	1,863.8	2,313.5	2,515.0	2,535.8	2,434.0	2,501.8
160.2	134.9	174.4	147.8	68 Awards, Certif, Logo Cost of Goods Sold	119.7	164.6	149.2	158.5	153.6	153.6	164.8	168.0	172.9
1,841.6	2,545.7	1,922.3	2,285.7	71 Research Projects & Grants Expense	2,649.6	2,469.6	2,678.0	2,321.1	3,219.5	3,953.5	3,574.8	2,650.5	2,678.5
81.3	100.8	153.0	162.0	73 Special Projects Expense	50.0	72.5	110.0	101.3	218.5	162.0	157.5		
72.6	60.3	66.7	60.5	76 Public Relations Expense	129.1	51.0	62.3	79.4	64.1	64.1	90.2	90.9	91.9
540.7	567.7	503.8	547.6	78 Occupancy & Insurance	563.4	559.2	575.9	588.6	595.7	595.7	644.5	656.9	675.8
1,621.5	1,673.0	1,561.3	1,696.9	82 Office Expense and Organizational Dues	1,746.9	1,840.2	1,892.7	1,862.7	1,889.7	2,002.1	2,000.3	2,012.6	2,027.5
1,317.8	1,876.7	1,568.6	2,342.0	84 Outside Services Expense	1,528.0	1,659.7	1,980.0	1,713.1	2,355.4	2,713.8	2,476.0	2,163.2	2,257.2
657.0	541.0	571.2	647.5	88 Other Expense	542.9	530.8	555.6	673.6	665.7	685.5	679.3	698.3	717.6
(636.0)		(650.3)	(435.4)	88.1 Prepaid Expense (contra acct)	(18.3)	33.8		(560.5)	(475.0)	(475.0)	(500.0)	(505.0)	(510.0)
	91.7	140.0	231.7	89 Opportunity Fund	35.0	35.5	100.0		140.0	240.0	240.0	100.0	100.0
527.6	543.5	485.0	492.7	90 Depreciation Expense	660.9	631.9	543.5	579.3	534.7	534.7	640.7	821.6	846.2
	0.0	0.3	28.2	91 Allocation of Overhead & BOD			0.0	0.0	0.0	0.0	0.0	0.0	0.0
23,032.6	**26,811.0**	**23,638.6**	**26,419.9**	**TOTAL EXPENSES**	**25,930.3**	**26,548.6**	**27,820.3**	**27,091.1**	**29,366.9**	**31,413.6**	**31,167.8**	**29,861.9**	**30,845.0**
1,931.5	(2,355.5)	1,894.0	1,380.7	SURPLUS (DEFICIT) before reserve income	404.2	1,231.3	(449.2)	702.1	67.1	(282.9)	(301.3)	(225.0)	(309.3)
				91.5 Headquarters Building Renewal Contributions	0.3								
				91.7 Gain on Merger		153.9							
477.3	483.6	67.4	349.3	92 Non-recurring Expenses	474.8	639.5	590.0	477.9	75.0	350.0	210.0		
				Reserve Investment Income:									
(187.3)	871.7	2,046.4	680.4	95 Investmt Income - Reserves (net of exp)	2,721.8	222.5	923.0	(186.1)	1,948.3	798.3	847.8	869.5	895.6
(600.7)	(641.4)	(568.3)	(2,080.3)	96 Transfer Reserves Portion Used Currently	(1,025.5)	(885.7)	(641.4)	(655.3)	(989.7)	(2,269.4)	(1,404.0)	(948.4)	(976.8)
(788.0)	230.3	1,478.1	(1,399.9)	Remaining Reserve Investment Income	1,696.3	(663.2)	281.6	(841.4)	958.6	(1,471.1)	(556.2)	(78.9)	(81.2)
666.2	**(2,608.8)**	**3,304.7**	**(368.5)**	**OVERALL SURPLUS (DEFICIT) after reserve incon**	**1,626.0**	**82.5**	**(757.6)**	**(617.2)**	**950.7**	**(2,104.0)**	**(1,067.5)**	**(303.9)**	**(390.5)**

ASHRAE
GENERAL (Fund 2)
Statement of Revenues and Expenses
For the Eleven Months Ending Wednesday, May 31, 2017

Fiscal YTD Through Month of May					TWELVE MONTHS ENDING JUNE 30						DRAFT	DRAFT	DRAFT
Actual	Budget	Actual	Budget		Actual	Actual	Budget	Actual	Forecast	Budget	Budget	Budget	Budget
FY 2016	FY 2016	FY 2017	FY 2017	acct / Description	FY 2014	FY 2015	FY 2016	FY 2016	FY 2017	FY 2017	FY 2018	FY 2019	FY 2020
				REVENUES									
$6,850.1	$6,932.4	$6,873.5	$7,168.3	31 Membership Dues Earned Income	$7,178.7	$7,281.8	$7,595.7	$7,481.7	$7,549.6	$7,828.6	$7,732.0	$7,888.8	$8,036.3
3,324.9	3,489.9	3,139.1	3,565.4	32 Publication Sales Income	3,803.6	3,483.9	3,585.5	3,626.1	3,528.8	3,924.8	3,700.1	3,855.6	3,942.8
3,555.3	3,475.1	3,324.3	3,610.2	34 Advertising Income - Display	3,773.1	3,710.8	3,761.0	3,779.4	3,613.1	3,846.0	3,658.2	3,824.9	3,985.5
17.6	24.0	16.9	22.8	34 Advertising Income - Classified	26.5	32.0	25.0	19.3	18.0	25.0	25.0	25.5	25.7
638.6	576.2	758.2	654.5	34 Advertising Income - On-line	470.4	595.6	640.0	715.8	845.0	720.0	870.0	895.0	920.0
1,020.0	1,100.7	1,557.0	1,340.1	35.1 Meeting & Seminar Income	1,965.7	1,578.5	1,737.5	1,529.9	2,206.6	1,968.5	1,889.3	1,679.4	1,695.3
163.9	205.6	181.4	218.4	35.2 Certification Registration	148.5	183.3	220.0	187.6	210.0	250.0	220.0	220.0	230.0
1,659.2	1,392.6	1,414.0	1,832.6	35.3 Education Registration	1,301.6	1,504.5	1,585.0	1,844.8	1,610.0	2,060.0	1,955.0	2,215.0	2,306.5
3.2		14.3		37 Special Project Income	50.0	316.6		3.2	45.0		50.0		
90.6	24.6	29.3	27.8	38 Contribution Income	47.2	72.7	30.4	104.2	41.0	41.0	42.3	42.9	43.8
5,168.0	4,757.6	5,623.7	5,168.0	41.1 AHR Exposition Income	3,973.0	5,146.6	4,757.6	5,168.0	5,624.0	5,168.0	5,802.5	4,800.0	5,168.0
(1,841.4)	(1,839.0)	(1,900.0)	(1,859.3)	41.2 Contributions and Matching Gifts	(1,859.2)	(1,699.5)	(1,839.0)	(1,841.4)	(1,862.7)	(1,859.3)	(1,950.5)	(1,779.4)	(1,834.0)
34.0	60.0	162.3	84.0	41.3 Exposition Income - Other Countries		145.9	60.0	34.0	162.3	84.0		50.0	
365.2	398.4		789.6	44 Reserve Transfers	489.2	314.5	398.4	398.4	421.4	861.4	719.0	733.4	755.4
304.9	282.6	284.4	319.5	46 Miscellaneous Income	341.9	534.4	295.9	322.7	373.6	349.5	544.9	529.8	491.2
21,354.1	**20,880.7**	**21,478.4**	**22,941.9**	**TOTAL REVENUES**	**21,710.2**	**23,201.6**	**22,853.0**	**23,373.7**	**24,385.7**	**25,267.5**	**25,257.8**	**24,980.9**	**25,766.5**
				EXPENSES:									
7,456.8	7,816.3	7,593.4	7,562.2	51 Salary Expense	6,988.0	7,357.2	7,832.3	8,205.5	8,258.7	8,328.5	8,766.0	9,105.1	9,335.5
2,226.8	2,219.3	2,256.7	2,256.7	52 Payroll Taxes, Benefits, Personnel Exp	2,119.3	2,375.3	2,241.5	2,581.5	2,471.4	2,493.0	2,657.2	2,726.6	2,907.3
3,194.4	3,498.0	2,848.6	3,385.5	61 Publishing and Promotion Expense	3,524.7	3,757.5	3,673.9	3,786.5	3,492.9	3,831.6	3,483.2	3,566.7	3,748.1
1,684.9	2,108.4	1,903.3	2,070.5	64 Meetings & Conferences Expense	2,286.6	2,178.5	2,262.2	2,335.7	2,617.8	2,768.8	2,674.6	2,336.9	2,401.5
1,474.1	2,079.7	1,734.6	2,061.8	66 Travel Expense	2,138.0	1,954.6	2,190.1	1,776.0	2,184.6	2,382.7	2,398.6	2,294.0	2,357.6
93.1	102.5	115.6	114.5	68 Awards, Certif, Logo Cost of Goods Sold	86.9	98.9	116.5	90.9	120.0	120.0	129.8	132.3	136.1
121.7	129.4	121.2	131.3	71 Research Projects & Grants Expense	106.5	100.9	127.5	121.7	131.3	131.3	136.6	139.3	143.5
81.3	100.8	153.0	162.0	73 Special Projects Expense	50.0	72.5	110.0	101.3	218.5	162.0	157.5		
72.6	60.0	66.7	60.2	76 Public Relations Expense	129.1	51.0	62.0	79.4	63.9	63.9	89.9	90.6	91.7
540.7	567.7	503.8	547.6	78 Occupancy & Insurance	563.4	559.2	575.9	588.6	595.7	595.7	644.5	656.9	675.8
1,579.0	1,620.1	1,518.6	1,646.9	82 Office Expense and Organizational Dues	1,704.0	1,788.1	1,835.4	1,815.0	1,833.0	1,944.1	1,940.0	1,951.1	1,964.1
1,312.8	1,876.7	1,568.6	2,342.0	84 Outside Services Expense	1,528.0	1,654.6	1,980.0	1,717.7	2,355.4	2,713.8	2,476.0	2,163.2	2,257.2
620.1	476.9	535.1	598.6	88 Other Expense	496.8	487.8	491.4	623.2	599.4	619.3	610.5	628.0	645.2
(636.0)		(650.3)	(435.4)	88.1 Prepaid Expense (contra acct)	(18.3)	33.8		(560.5)	(475.0)	(475.0)	(500.0)	(505.0)	(510.0)
	91.7	140.0	231.7	89 Opportunity Fund	35.0	35.5	100.0		140.0	240.0	240.0	100.0	100.0
527.6	543.5	485.0	492.7	90 Depreciation Expense	660.9	631.9	543.5	579.3	534.7	534.7	640.7	821.6	846.2
(672.9)	(840.0)	(725.5)	(793.7)	91 Allocation of Overhead & BOD	(730.0)	(808.5)	(840.0)	(750.3)	(823.7)	(903.9)	(985.9)	(1,001.5)	(1,024.3)
19,677.0	**22,451.0**	**20,168.4**	**22,435.1**	**TOTAL EXPENSES**	**21,668.9**	**22,328.8**	**23,302.2**	**23,091.5**	**24,318.6**	**25,550.5**	**25,559.2**	**25,205.8**	**26,075.5**
1,677.1	(1,570.3)	1,310.0	506.8	SURPLUS (DEFICIT) before reserve income	41.3	872.8	(449.2)	282.2	67.1	(283.0)	(301.4)	(224.9)	(309.0)
				91.5 Headquarters Building Renewal Contributions	0.3								
477.3	483.6	67.4	349.3	92 Non-recurring Expenses	474.8	639.5	590.0	477.9	75.0	350.0	210.0		
				Reserve Investment Income:									
(117.4)	572.9	1,413.1	473.6	95 Investmt Income - Reserves (net of exp)	1,778.1	146.5	603.0	(115.9)	1,366.1	566.1	614.7	634.0	653.1
(365.2)	(398.4)		(789.6)	96 Transfer Reserves Portion Used Currently	(489.2)	(314.5)	(398.4)	(398.4)	(421.4)	(861.4)	(719.0)	(733.4)	(755.4)
(482.6)	174.5	1,413.1	(316.0)	Remaining Reserve Investment Income	1,288.9	(168.0)	204.6	(514.3)	944.7	(295.3)	(104.3)	(99.4)	(102.3)
717.2	**(1,879.4)**	**2,655.7**	**(158.5)**	**OVERALL SURPLUS (DEFICIT) after reserve incon**	**855.7**	**65.3**	**(834.6)**	**(710.0)**	**936.8**	**(928.3)**	**(615.7)**	**(324.3)**	**(411.3)**

ASHRAE
BOARD OF DIRECTORS 2-5nn
Statement of Revenues and Expenses
For the Eleven Months Ending Wednesday, May 31, 2017

Fiscal YTD Through Month of May					TWELVE MONTHS ENDING JUNE 30						DRAFT	DRAFT	DRAFT
Actual	Budget	Actual	Budget		Actual	Actual	Budget	Actual	Forecast	Budget	Budget	Budget	Budget
FY 2016	FY 2016	FY 2017	FY 2017	acct / Description	FY 2014	FY 2015	FY 2016	FY 2016	FY 2017	FY 2017	FY 2018	FY 2019	FY 2020
				REVENUES									
	$4.2		$7.3	38 Contribution Income	$4.5	$23.5	$8.0		$8.0	$8.0	$8.3	$8.5	$8.7
0.0	0.0	80.0	80.0	41.2 Contributions and Matching Gifts			0.0	0.0	80.0	80.0	0.0	0.0	0.0
			220.0	44 Reserve Transfers						240.0			
0.3			5.0	46 Miscellaneous Income	2.5	273.0		0.3		5.0	43.0	95.0	168.0
0.3	**4.2**	**80.0**	**312.3**	**TOTAL REVENUES**	**7.0**	**296.5**	**8.0**	**0.3**	**88.0**	**333.0**	**51.3**	**103.5**	**176.7**
				EXPENSES:									
738.2	1,023.7	787.5	857.6	51 Salary Expense	735.7	972.4	1,039.3	811.0	892.5	947.1	1,002.7	1,045.5	1,261.2
212.8	270.3	212.0	241.9	52 Payroll Taxes, Benefits, Personnel Exp	214.4	272.0	274.4	245.1	251.7	265.3	270.0	275.6	331.9
26.9	101.7	31.5	132.3	61 Publishing and Promotion Expense	69.4	10.0	107.3	26.9	108.1	141.7	124.6	121.7	124.8
67.2	61.2	135.0	61.6	64 Meetings & Conferences Expense	71.0	64.0	61.6	83.8	83.7	70.7	99.6	71.0	73.1
671.8	1,000.3	759.2	992.2	66 Travel Expense	1,017.9	887.9	1,036.8	782.6	815.1	1,067.6	1,024.1	965.1	994.5
9.8	3.2	11.8	3.6	68 Awards, Certif, Logo Cost of Goods Sold	9.1	14.9	3.7	9.9	3.8	3.8	3.9	4.0	4.1
7.3	7.8	7.4	8.1	71 Research Projects & Grants Expense	7.1	7.2	7.8	7.3	8.1	8.1	8.4	8.6	8.8
				76 Public Relations Expense	1.2	0.1							
16.4	44.1	12.1	51.4	82 Office Expense and Organizational Dues	42.6	60.5	44.8	16.5	44.4	57.4	49.9	50.8	52.2
51.8	184.9	163.5	508.3	84 Outside Services Expense	69.2	204.6	191.6	73.2	276.2	578.7	317.8	129.8	142.8
7.0	9.7		20.7	88 Other Expense	0.5	1.9	10.6	7.0	7.7	22.6	2.8	2.9	3.0
0.0		0.0	0.0	88.1 Prepaid Expense (contra acct)				0.0	0.0	0.0	0.0	0.0	0.0
	91.7		91.7	89 Opportunity Fund	35.0	35.5	100.0			100.0	100.0	100.0	100.0
0.2				90 Depreciation Expense	4.1	3.2		0.2			65.0	65.0	65.0
(1,800.3)	(2,877.9)	(2,112.4)	(2,834.9)	91 Allocation of Overhead & BOD	(2,277.4)	(2,534.2)	(2,877.9)	(2,063.5)	(2,491.3)	(3,263.0)	(3,068.8)	(2,840.0)	(3,161.4)
9.1	**(79.3)**		**134.5**	**TOTAL EXPENSES**		**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
(8.8)	83.5	80.0	177.8	SURPLUS (DEFICIT) before reserve income	7.0	296.5	8.0	0.3	88.0	333.0	51.3	103.5	176.7

ASHRAE
MEMBERS COUNCIL (2-2nn & 2-8nn)
Statement of Revenues and Expenses
For the Eleven Months Ending Wednesday, May 31, 2017

Fiscal YTD Through Month of May					TWELVE MONTHS ENDING JUNE 30						DRAFT	DRAFT	DRAFT
Actual	*Budget*	Actual	*Budget*		Actual	Actual	*Budget*	Actual	Forecast	*Budget*	Budget	Budget	Budget
FY 2016	*FY 2016*	FY 2017	*FY 2017*	acct / Description	FY 2014	FY 2015	*FY 2016*	FY 2016	FY 2017	*FY 2017*	FY 2018	FY 2019	FY 2020
				REVENUES									
$6,850.1	$6,932.4	$6,873.5	$7,168.3	31 Membership Dues Earned Income	$7,178.7	$7,281.8	$7,595.7	$7,481.7	$7,549.6	$7,828.6	$7,732.0	$7,888.8	$8,036.3
1,020.0	1,100.7	1,557.0	1,340.1	35.1 Meeting & Seminar Income	1,965.7	1,578.5	1,737.5	1,529.9	2,206.6	1,968.5	1,889.3	1,679.4	1,695.3
80.5	8.4	21.7	8.4	38 Contribution Income	25.6	38.4	8.4	92.1	18.7	18.7	19.0	19.2	19.6
20.0	20.4	20.0	20.3	41.2 Contributions and Matching Gifts	20.0	20.0	20.4	20.0	20.3	20.3	20.7	20.9	21.6
114.2	79.2	114.3	89.8	46 Miscellaneous Income	103.0	153.3	83.6	117.9	139.7	99.7	112.6	74.1	76.3
8,084.8	**8,141.1**	**8,586.5**	**8,626.9**	**TOTAL REVENUES**	**9,293.0**	**9,072.0**	**9,445.6**	**9,241.6**	**9,934.9**	**9,935.8**	**9,773.6**	**9,682.4**	**9,849.1**
				EXPENSES:									
1,203.2	1,242.9	1,216.0	1,242.3	51 Salary Expense	1,175.4	1,135.0	1,243.3	1,330.7	1,369.7	1,369.7	1,455.7	1,516.0	1,596.2
341.0	328.2	327.8	363.0	52 Payroll Taxes, Benefits, Personnel Exp	342.6	313.7	328.3	404.7	399.0	399.0	406.7	415.2	383.1
362.2	374.3	314.2	302.1	61 Publishing and Promotion Expense	339.3	422.2	404.5	398.0	313.6	313.6	334.1	337.9	348.0
1,130.7	1,641.4	1,296.8	1,470.6	64 Meetings & Conferences Expense	1,841.9	1,644.0	1,740.7	1,658.4	1,913.2	2,103.3	1,957.1	1,641.7	1,691.0
513.2	687.1	588.7	692.2	66 Travel Expense	667.6	668.7	731.9	625.0	845.7	843.6	878.7	825.7	848.3
83.4	95.5	73.7	83.0	68 Awards, Certif, Logo Cost of Goods Sold	76.6	82.8	108.8	80.0	86.0	86.0	94.4	96.2	99.0
114.4	121.6	113.8	123.2	71 Research Projects & Grants Expense	99.4	93.7	119.6	114.4	123.2	123.2	128.2	130.7	134.7
302.2	317.1	315.3	345.9	82 Office Expense and Organizational Dues	330.0	299.4	359.4	319.9	370.3	370.3	435.6	393.7	405.5
154.0	173.2	172.9	230.2	84 Outside Services Expense	178.1	175.2	178.4	195.6	253.5	278.5	248.0	194.0	199.8
242.0	243.4	288.8	282.1	88 Other Expense	259.2	294.1	246.1	285.9	316.2	323.2	319.5	324.2	334.0
(137.3)		(193.2)		88.1 Prepaid Expense (contra acct)	2.0	13.5		(8.8)					
		140.0	140.0	89 Opportunity Fund					140.0	140.0	140.0		
1,547.4	1,829.6	1,686.1	1,776.9	91 Allocation of Overhead & BOD	1,603.9	1,657.9	1,829.6	1,736.4	1,792.1	1,966.7	1,915.3	1,946.0	1,990.2
5,856.4	**7,054.3**	**6,340.9**	**7,051.5**	**TOTAL EXPENSES**	**6,916.0**	**6,800.2**	**7,290.6**	**7,140.2**	**7,922.5**	**8,317.1**	**8,313.3**	**7,821.3**	**8,029.8**
2,228.4	1,086.8	2,245.6	1,575.4	SURPLUS (DEFICIT) before reserve income	2,377.0	2,271.8	2,155.0	2,101.4	2,012.4	1,618.7	1,460.3	1,861.1	1,819.3

ASHRAE
PUBLISHING & EDUCATION COUNCIL (2-4nn & 5-5nn)
Statement of Revenues and Expenses
For the Eleven Months Ending Wednesday, May 31, 2017

Fiscal YTD Through Month of May					TWELVE MONTHS ENDING JUNE 30						DRAFT	DRAFT	DRAFT
Actual	Budget	Actual	Budget		Actual	Actual	Budget	Actual	Forecast	Budget	Budget	Budget	Budget
FY 2016	FY 2016	FY 2017	FY 2017	acct / Description	FY 2014	FY 2015	FY 2016	FY 2016	FY 2017	FY 2017	FY 2018	FY 2019	FY 2020
				REVENUES									
$3,324.9	$3,489.9	$3,139.1	$3,565.4	32 Publication Sales Income	$3,803.6	$3,483.9	$3,585.5	$3,626.1	$3,528.8	$3,924.8	$3,700.1	$3,855.6	$3,942.8
3,555.3	3,475.1	3,324.3	3,610.2	34 Advertising Income - Display	3,773.1	3,710.8	3,761.0	3,779.4	3,613.1	3,846.0	3,658.2	3,824.9	3,985.5
17.6	24.0	16.9	22.8	34 Advertising Income - Classified	26.5	32.0	25.0	19.3	18.0	25.0	25.0	25.5	25.7
638.6	576.2	758.2	654.5	34 Advertising Income - On-line	470.4	595.6	640.0	715.8	845.0	720.0	870.0	895.0	920.0
163.9	205.6	181.4	218.4	35.2 Certification Registration	148.5	183.3	220.0	187.6	210.0	250.0	220.0	220.0	230.0
1,659.2	1,392.6	1,414.0	1,832.6	35.3 Education Registration	1,301.6	1,504.5	1,585.0	1,844.8	1,610.0	2,060.0	1,955.0	2,215.0	2,306.5
				37 Special Project Income	45.0	230.0							
10.1	11.9	7.6	12.1	38 Contribution Income	17.0	10.8	13.9	12.1	14.3	14.3	14.9	15.2	15.5
95.0	97.0	50.0	98.6	41.2 Contributions and Matching Gifts	110.0	95.0	97.0	95.0	95.0	98.6	86.8	87.7	89.2
163.9	148.1	127.2	174.4	46 Miscellaneous Income	195.3	143.1	155.2	184.4	175.9	186.8	177.5	182.8	183.6
9,628.5	**9,420.4**	**9,018.7**	**10,189.0**	**TOTAL REVENUES**	**9,891.0**	**9,989.0**	**10,082.6**	**10,464.5**	**10,110.1**	**11,125.5**	**10,707.5**	**11,321.7**	**11,698.8**
				EXPENSES:									
2,197.0	2,364.0	2,165.0	2,216.8	51 Salary Expense	2,232.8	2,218.4	2,364.0	2,411.7	2,411.7	2,434.9	2,468.4	2,570.6	2,743.1
666.5	664.6	680.9	673.1	52 Payroll Taxes, Benefits, Personnel Exp	717.3	706.0	673.2	780.7	776.4	756.3	742.1	759.6	805.8
2,778.6	3,016.9	2,445.7	2,842.3	61 Publishing and Promotion Expense	3,105.4	3,302.7	3,133.0	3,331.8	2,963.0	3,258.1	2,910.7	3,003.1	3,168.9
458.4	372.1	443.8	504.2	64 Meetings & Conferences Expense	354.7	451.6	426.8	564.6	586.6	560.0	582.2	587.9	600.1
89.2	165.8	118.9	154.5	66 Travel Expense	196.9	178.4	187.1	137.8	180.0	205.7	194.0	196.6	200.7
(0.3)	2.3	0.6	2.3	68 Awards, Certif, Logo Cost of Goods Sold	0.8	1.0	2.5	0.8	2.6	2.6	2.7	2.7	2.8
		0.5		76 Public Relations Expense									
38.1	43.2	36.4	38.4	78 Occupancy & Insurance	36.3	36.1	40.1	40.6	41.3	41.3	42.9	43.8	45.1
840.5	805.1	752.6	800.9	82 Office Expense and Organizational Dues	894.2	963.5	969.4	1,036.6	919.4	1,027.5	942.2	983.5	967.7
670.6	976.5	793.3	1,086.8	84 Outside Services Expense	744.5	817.2	1,054.3	938.3	1,266.9	1,291.3	1,281.4	1,215.3	1,270.6
275.6	156.2	132.8	193.7	88 Other Expense	143.7	108.1	162.5	227.7	165.7	163.6	171.7	178.6	182.4
				90 Depreciation Expense	61.0	45.8							
2,829.1	3,478.9	2,996.9	3,449.6	91 Allocation of Overhead & BOD	3,048.4	3,237.1	3,478.9	3,147.3	3,451.0	3,787.1	4,057.5	4,122.5	4,216.2
10,843.3	**12,045.6**	**10,567.4**	**11,962.6**	**TOTAL EXPENSES**	**11,536.0**	**12,065.9**	**12,491.8**	**12,617.9**	**12,764.6**	**13,528.4**	**13,395.8**	**13,664.2**	**14,203.4**
(1,214.8)	(2,625.2)	(1,548.7)	(1,773.6)	SURPLUS (DEFICIT) before reserve income	(1,645.0)	(2,076.9)	(2,409.2)	(2,153.4)	(2,654.5)	(2,402.9)	(2,688.3)	(2,342.5)	(2,504.6)

ASHRAE
TECHNOLOGY COUNCIL
Statement of Revenues and Expenses
For the Eleven Months Ending Wednesday, May 31, 2017

Fiscal YTD Through Month of May					TWELVE MONTHS ENDING JUNE 30						DRAFT	DRAFT	DRAFT
Actual	Budget	Actual	Budget		Actual	Actual	Budget	Actual	Forecast	Budget	Budget	Budget	Budget
FY 2016	FY 2016	FY 2017	FY 2017	acct / Description	FY 2014	FY 2015	FY 2016	FY 2016	FY 2017	FY 2017	FY 2018	FY 2019	FY 2020
				REVENUES									
$3.2		$14.3		37 Special Project Income	$5.0	$86.6		$3.2	$45.0		$50.0		
13.0	24.3	23.3	23.8	46 Miscellaneous Income	17.0	12.2	25.3	15.0	26.0	26.0	27.1	27.6	28.4
16.2	**24.3**	**37.6**	**23.8**	**TOTAL REVENUES**	**22.0**	**98.8**	**25.3**	**18.2**	**71.0**	**26.0**	**77.1**	**27.6**	**28.4**
				EXPENSES:									
1,027.7	1,123.5	1,089.2	966.7	51 Salary Expense	1,060.1	1,108.7	1,123.5	1,125.8	1,068.9	1,060.9	1,154.5	1,163.6	1,197.4
292.1	296.6	292.3	279.3	52 Payroll Taxes, Benefits, Personnel Exp	296.7	322.2	296.6	322.8	307.0	304.6	316.5	317.0	352.6
0.0	0.7	0.5	2.2	61 Publishing and Promotion Expense	5.5	0.8	2.2	0.3	2.3	2.3	2.4	2.4	2.5
8.7	19.0	15.8	20.8	64 Meetings & Conferences Expense	11.3	8.2	19.8	8.8	20.6	21.2	21.5	21.8	22.4
70.3	141.4	123.3	138.0	66 Travel Expense	163.2	132.5	147.4	93.2	197.1	176.1	191.6	194.8	199.8
0.3	1.6	0.1	1.6	68 Awards, Certif, Logo Cost of Goods Sold	0.4	0.3	1.6	0.3	1.6	1.6	1.7	1.7	1.8
81.3	100.8	153.0	162.0	73 Special Projects Expense	50.0	72.5	110.0	101.3	218.5	162.0	157.5		
	2.2		2.3	76 Public Relations Expense			2.4		2.5	2.5	2.6	2.6	2.7
88.8	109.3	93.2	119.3	82 Office Expense and Organizational Dues	109.0	90.1	109.5	88.9	120.7	120.7	126.5	127.9	131.7
35.1	49.4	9.2	49.1	84 Outside Services Expense	57.5	2.8	53.7	39.3	54.1	55.3	74.4	58.6	60.3
0.0	0.1		0.1	88 Other Expense			0.1	0.0	0.1	0.1	0.1	0.1	0.1
				88.1 Prepaid Expense (contra acct)	(20.3)	20.3							
19.2		0.0		90 Depreciation Expense	27.0	27.0		19.2					
1,321.7	1,653.2	1,497.3	1,644.8	91 Allocation of Overhead & BOD	1,442.7	1,621.0	1,653.2	1,467.2	1,638.2	1,797.8	1,800.6	1,829.4	1,871.0
2,945.2	**3,497.8**	**3,273.9**	**3,386.2**	**TOTAL EXPENSES**	**3,203.1**	**3,406.4**	**3,520.0**	**3,267.1**	**3,631.6**	**3,705.1**	**3,849.9**	**3,719.9**	**3,842.3**
(2,929.0)	(3,473.5)	(3,236.3)	(3,362.4)	SURPLUS (DEFICIT) before reserve income	(3,181.1)	(3,307.6)	(3,494.7)	(3,248.9)	(3,560.6)	(3,679.1)	(3,772.8)	(3,692.3)	(3,813.9)

ASHRAE
RESEARCH (funds 3 & 4)
Statement of Revenues and Expenses
For the Eleven Months Ending Wednesday, May 31, 2017

Fiscal YTD Through Month of May					TWELVE MONTHS ENDING JUNE 30						DRAFT	DRAFT	DRAFT
Actual	Budget	Actual	Budget	roll up	Actual	Actual	Budget	Actual	Forecast	Budget	Budget	Budget	Budget
FY 2016	FY 2016	FY 2017	FY 2017	acct / Description	FY 2014	FY 2015	FY 2016	FY 2016	FY 2017	FY 2017	FY 2018	FY 2019	FY 2020
				REVENUES									
$139.8	$154.5	$140.3	$143.6	31 Membership Dues Earned Income	$146.6	$148.7	$154.5	$152.7	$156.8	$156.8	$157.0	$162.0	$165.0
				37 Special Project Income	55.0								
1,272.6	1,276.0	1,280.3	1,421.0	38 Contribution Income	1,898.4	2,000.2	2,219.0	2,046.7	2,319.8	2,294.8	2,398.5	2,446.4	2,495.4
1,898.4	1,898.4	2,000.0	2,000.2	41.2 Contributions and Matching Gifts	1,989.2	1,814.5	1,898.4	1,898.4	2,000.0	2,000.2	2,000.0	1,828.9	1,883.8
235.5	243.0	568.3	1,290.7	44 Reserve Transfers	536.3	571.2	243.0	256.9	568.3	1,408.0	1,049.7	215.0	221.5
0.0	3.0		3.1	46 Miscellaneous Income	(1.1)		3.3	0.0	3.4	3.4	3.5	3.6	3.7
3,546.3	**3,574.9**	**3,988.9**	**4,858.6**	**TOTAL REVENUES**	**4,624.4**	**4,534.6**	**4,518.2**	**4,354.7**	**5,048.3**	**5,863.2**	**5,608.7**	**4,655.9**	**4,769.4**
				EXPENSES:									
523.2	570.8	519.8	512.4	51 Salary Expense	535.7	553.8	570.8	575.2	563.3	563.3	594.6	617.9	662.3
150.4	150.7	140.5	148.1	52 Payroll Taxes, Benefits, Personnel Exp	152.4	160.9	150.7	157.3	161.8	161.8	164.9	168.4	179.9
41.1	93.8	27.9	87.8	61 Publishing and Promotion Expense	44.4	19.4	103.4	41.3	104.2	104.2	105.4	31.0	31.9
26.0	16.4	30.1	16.9	64 Meetings & Conferences Expense	6.5	20.7	16.9	27.0	21.4	17.4	18.1	18.4	19.0
68.6	122.2	86.4	110.8	66 Travel Expense	127.6	119.1	131.4	84.0	128.9	132.3	137.2	139.9	144.1
37.1	32.4	47.0	33.4	68 Awards, Certif, Logo Cost of Goods Sold	32.7	35.6	32.7	37.4	33.6	33.6	35.0	35.7	36.8
1,719.9	2,416.3	1,801.2	2,154.4	71 Research Projects & Grants Expense	2,543.0	2,368.7	2,550.5	2,199.4	3,088.2	3,822.2	3,438.2	2,511.2	2,535.0
	0.2		0.2	76 Public Relations Expense			0.2		0.2	0.2	0.3	0.3	0.3
40.5	52.9	42.7	50.0	82 Office Expense and Organizational Dues	42.9	52.1	57.3	45.7	56.7	58.0	60.3	61.5	63.4
4.8				84 Outside Services Expense		4.8		(4.8)					
36.9	64.1	36.1	48.9	88 Other Expense	46.1	43.0	64.3	50.4	66.2	66.2	68.9	70.2	72.3
672.9	840.0	725.7	821.9	91 Allocation of Overhead & BOD	730.0	808.5	840.0	750.3	823.7	903.9	985.9	1,001.5	1,024.3
3,321.4	**4,359.8**	**3,457.4**	**3,984.8**	**TOTAL EXPENSES**	**4,261.3**	**4,186.6**	**4,518.2**	**3,963.2**	**5,048.2**	**5,863.1**	**5,608.8**	**4,656.0**	**4,769.3**
224.9	(784.9)	531.5	873.8	SURPLUS (DEFICIT) before reserve income	363.1	348.0	0.0	391.5	0.1	0.1	(0.1)	(0.1)	0.1
				Reserve Investment Income:									
(69.4)	298.9	618.9	206.8	95 Investmt Income - Reserves (net of exp)	943.7	75.2	320.0	(70.1)	582.2	232.2	233.1	235.5	242.6
(235.5)	(243.0)	(568.3)	(1,290.7)	96 Transfer Reserves Portion Used Currentl	(536.3)	(571.2)	(243.0)	(256.9)	(568.3)	(1,408.0)	(685.0)	(215.0)	(221.5)
(304.9)	55.9	50.6	(1,083.9)	Remaining Reserve Investment Income	407.4	(496.0)	77.0	(327.0)	13.9	(1,175.8)	(451.9)	20.5	21.1
(80.0)	**(729.0)**	**582.1**	**(210.1)**	**OVERALL SURPLUS (DEFICIT) after reser**	**770.5**	**(148.0)**	**77.0**	**64.5**	**14.0**	**(1,175.7)**	**(452.0)**	**20.4**	**21.2**

ASHRAE
GENERAL (Fund 2)
Major Variations
For the Eleven Months Ending Wednesday, May 31, 2017

Fiscal YTD Through Month of May					TWELVE MONTHS ENDING JUNE 30						Variance	
Actual	Budget	Actual	Budget		Actual	Actual	Budget	Actual	Forecast	Budget	Budget vs.	Comments
FY 2016	FY 2016	FY 2017	FY 2017	acct / Description	FY 2014	FY 2015	FY 2016	FY 2016	FY 2017	FY 2017	Forecast	
				REVENUES								
$6,850.1	$6,932.4	$6,873.5	$7,168.3	31 Membership Dues Earned Income	$7,178.7	$7,281.8	$7,595.7	$7,481.7	$7,549.6	$7,828.6	($279.0)	Membership growth primarily students - not Full/Associate Members.
3,324.9	3,489.9	3,139.1	3,565.4	32 Publication Sales Income	3,803.6	3,483.9	3,585.5	3,626.1	3,528.8	3,924.8	($396.0)	Income down for the year across all book and non-print publication categories. Pub/Ed looking at promotional opportunites.
3,555.3	3,475.1	3,324.3	3,610.2	34 Advertising Income - Display	3,773.1	3,710.8	3,761.0	3,779.4	3,613.1	3,846.0	($232.9)	Some shifting from print to online advertising as print/digital sales increase
17.6	24.0	16.9	22.8	34 Advertising Income - Classified	26.5	32.0	25.0	19.3	18.0	25.0	($7.0)	
638.6	576.2	758.2	654.5	34 Advertising Income - On-line	470.4	595.6	640.0	715.8	845.0	720.0	$125.0	Additional online opportunities being made available.
1,020.0	1,100.7	1,557.0	1,340.1	35.1 Meeting & Seminar Income	1,965.7	1,578.5	1,737.5	1,529.9	2,206.6	1,968.5	$238.1	Primarily related to Winter Meeting record breaking attendance
163.9	205.6	181.4	218.4	35.2 Certification Registration	148.5	183.3	220.0	187.6	210.0	250.0	($40.0)	
1,659.2	1,392.6	1,414.0	1,832.6	35.3 Education Registration	1,301.6	1,504.5	1,585.0	1,844.8	1,610.0	2,060.0	($450.0)	eLearning was offline for 3 months at the beginning of the fiscal year and monthly sales lagged compared to budget. Looking at new promotional opportunities.
3.2		14.3		37 Special Project Income	50.0	316.6		3.2	45.0		$45.0	
90.6	24.6	29.3	27.8	38 Contribution Income	47.2	72.7	30.4	104.2	41.0	41.0	$0.0	
5,168.0	4,757.6	5,623.7	5,168.0	41.1 AHR Exposition Income	3,973.0	5,146.6	4,757.6	5,168.0	5,624.0	5,168.0	$456.0	Winter Meeting was largest EXPO to date (just over 500,000 net sq. ft.)
(1,841.4)	(1,839.0)	(1,900.0)	(1,859.3)	41.2 Contributions and Matching Gifts	(1,859.2)	(1,699.5)	(1,839.0)	(1,841.4)	(1,862.7)	(1,859.3)	($3.4)	
34.0	60.0	162.3	84.0	41.3 Exposition Income - Other Countries		145.9	60.0	34.0	162.3	84.0	$78.3	Larger than anticipated Mexico AHR show (Monterrey)
365.2	398.4		789.6	44 Reserve Transfers	489.2	314.5	398.4	398.4	421.4	861.4	($440.0)	Primarily related to Capital Campaign not utilizing any reserve funding in 16-17.
304.9	282.6	284.4	319.5	46 Miscellaneous Income	341.9	534.4	295.9	322.7	373.6	349.5	$24.1	
21,354.1	**20,880.7**	**21,478.4**	**22,941.9**	**TOTAL REVENUES**	**21,710.2**	**23,201.6**	**22,853.0**	**23,373.7**	**24,385.7**	**25,267.5**		
				EXPENSES:								
7,456.8	7,816.3	7,593.4	7,562.2	51 Salary Expense	6,988.0	7,357.2	7,832.3	8,205.5	8,258.7	8,328.5	($69.8)	
2,226.8	2,219.3	2,256.7	2,256.7	52 Payroll Taxes, Benefits, Personnel Exp	2,119.3	2,375.3	2,241.5	2,581.5	2,471.4	2,493.0	($21.6)	
3,194.4	3,498.0	2,848.6	3,385.5	61 Publishing and Promotion Expense	3,524.7	3,757.5	3,673.9	3,786.5	3,492.9	3,831.6	($338.7)	Reduced product sales translates into decreased expenditures (printing, COGS, shipping, commissions, etc.)
1,684.9	2,108.4	1,903.3	2,070.5	64 Meetings & Conferences Expense	2,286.6	2,178.5	2,262.2	2,335.7	2,617.8	2,768.8	($151.0)	Lower than anticipated conference expenses for several meetings in 17-16
1,474.1	2,079.7	1,734.6	2,061.8	66 Travel Expense	2,138.0	1,954.6	2,190.1	1,776.0	2,184.6	2,382.7	($198.1)	Travel continues to lag budget - adjusted forecast down
93.1	102.5	115.6	114.5	68 Awards, Certif, Logo Cost of Goods Sold	86.9	98.9	116.5	90.9	120.0	120.0	$0.0	
121.7	129.4	121.2	131.3	71 Research Projects & Grants Expense	106.5	100.9	127.5	121.7	131.3	131.3	$0.0	
81.3	100.8	153.0	162.0	73 Special Projects Expense	50.0	72.5	110.0	101.3	218.5	162.0	$56.5	
72.6	60.0	66.7	60.2	76 Public Relations Expense	129.1	51.0	62.0	79.4	63.9	63.9	$0.0	
540.7	567.7	503.8	547.6	78 Occupancy & Insurance	563.4	559.2	575.9	588.6	595.7	595.7	$0.0	
1,579.0	1,620.1	1,518.6	1,646.9	82 Office Expense and Organizational Dues	1,704.0	1,788.1	1,835.4	1,815.0	1,833.0	1,944.1	($111.1)	
1,312.8	1,876.7	1,568.6	2,342.0	84 Outside Services Expense	1,528.0	1,654.6	1,980.0	1,717.7	2,355.4	2,713.8	($358.4)	Reduced anticipated expenditures for Global Training Center. Budgeted at $200K. In addition, reduced scope for capital campaign consultant for 16-17.
620.1	476.9	535.1	598.6	88 Other Expense	496.8	487.8	491.4	623.2	599.4	619.3	($19.9)	
(636.0)		(650.3)	(435.4)	88.1 Prepaid Expense (contra acct)	(18.3)	33.8		(560.5)	(475.0)	(475.0)	$0.0	
	91.7	140.0	231.7	89 Opportunity Fund	35.0	35.5	100.0		140.0	240.0	($100.0)	Nothing was paid out of the Opportunity Fund in 16-17
527.6	543.5	485.0	492.7	90 Depreciation Expense	660.9	631.9	543.5	579.3	534.7	534.7		
(672.9)	(840.0)	(725.5)	(793.7)	91 Allocation of Overhead & BOD	(730.0)	(808.5)	(840.0)	(750.3)	(823.7)	(903.9)		
19,677.0	**22,451.0**	**20,168.4**	**22,435.1**	**TOTAL EXPENSES**	**21,668.9**	**22,328.8**	**23,302.2**	**23,091.5**	**24,318.6**	**25,550.5**		
1,677.1	(1,570.3)	1,310.0	506.8	SURPLUS (DEFICIT) before reserve income	41.3	872.8	(449.2)	282.2	67.1	(283.0)		

ASHRAE
BOARD OF DIRECTORS 2-5nn
Major Variations
For the Eleven Months Ending Wednesday, May 31, 2017

Fiscal YTD Through Month of May					TWELVE MONTHS ENDING JUNE 30						Variance	
Actual	Budget	Actual	Budget		Actual	Actual	Budget	Actual	Forecast	Budget	Budget vs.	Comments
FY 2016	FY 2016	FY 2017	FY 2017	acct / Description	FY 2014	FY 2015	FY 2016	FY 2016	FY 2017	FY 2017	Forecast	
				REVENUES								
	$4.2		$7.3	38 Contribution Income	$4.5	$23.5	$8.0		$8.0	$8.0	$0.0	
0.0	0.0	80.0	80.0	41.2 Contributions and Matching Gifts			0.0	0.0	80.0	80.0	$0.0	
			220.0	44 Reserve Transfers						240.0	($240.0)	No Reserve Transfers needed for Cap Campaign
0.3			5.0	46 Miscellaneous Income	2.5	273.0		0.3		5.0	($5.0)	
0.3	**4.2**	**80.0**	**312.3**	**TOTAL REVENUES**	**7.0**	**296.5**	**8.0**	**0.3**	**88.0**	**333.0**		
				EXPENSES:								
738.2	1,023.7	787.5	857.6	51 Salary Expense	735.7	972.4	1,039.3	811.0	892.5	947.1	($54.6)	
212.8	270.3	212.0	241.9	52 Payroll Taxes, Benefits, Personnel Exp	214.4	272.0	274.4	245.1	251.7	265.3	($13.6)	
26.9	101.7	31.5	132.3	61 Publishing and Promotion Expense	69.4	10.0	107.3	26.9	108.1	141.7	($33.6)	
67.2	61.2	135.0	61.6	64 Meetings & Conferences Expense	71.0	64.0	61.6	83.8	83.7	70.7	$13.0	
671.8	1,000.3	759.2	992.2	66 Travel Expense	1,017.9	887.9	1,036.8	782.6	815.1	1,067.6	($252.5)	Travel for several BOD committees lower than budgeted. Low expenses for Strategic Plan Initiatives #1, 2, 5 ($70K budget).
9.8	3.2	11.8	3.6	68 Awards, Certif, Logo Cost of Goods Sold	9.1	14.9	3.7	9.9	3.8	3.8	$0.0	
7.3	7.8	7.4	8.1	71 Research Projects & Grants Expense	7.1	7.2	7.8	7.3	8.1	8.1	$0.0	
				76 Public Relations Expense	1.2	0.1					$0.0	
16.4	44.1	12.1	51.4	82 Office Expense and Organizational Dues	42.6	60.5	44.8	16.5	44.4	57.4	($13.0)	
51.8	184.9	163.5	508.3	84 Outside Services Expense	69.2	204.6	191.6	73.2	276.2	578.7	($302.5)	Reduced anticipated expenditures for Global Training Center. Budgeted at $200K. In addition, reduced scope for capital campaign consultant for 16-17 and no expenses for Strategic Plan Initiative #5 ($75K budget)
7.0	9.7		20.7	88 Other Expense	0.5	1.9	10.6	7.0	7.7	22.6	($14.9)	
0.0		0.0	0.0	88.1 Prepaid Expense (contra acct)				0.0	0.0	0.0	$0.0	
	91.7		91.7	89 Opportunity Fund	35.0	35.5	100.0			100.0	($100.0)	Nothing was paid out of the Opportunity Fund in 16-17
0.2				90 Depreciation Expense	4.1	3.2		0.2				
(1,800.3)	(2,877.9)	(2,112.4)	(2,834.9)	91 Allocation of Overhead & BOD	(2,277.4)	(2,534.2)	(2,877.9)	(2,063.5)	(2,491.3)	(3,263.0)		
9.1	**(79.3)**		**134.5**	**TOTAL EXPENSES**		**0.0**	**0.0**	**0.0**	**0.0**	**0.0**		
(8.8)	83.5	80.0	177.8	SURPLUS (DEFICIT) before reserve income	7.0	296.5	8.0	0.3	88.0	333.0		

ASHRAE
MEMBERS COUNCIL (2-2nn & 2-8nn)
Major Variations
For the Eleven Months Ending Wednesday, May 31, 2017

Fiscal YTD Through Month of May					TWELVE MONTHS ENDING JUNE 30						Variance	
Actual	Budget	Actual	Budget		Actual	Actual	Budget	Actual	Forecast	Budget	Budget vs.	Comments
FY 2016	FY 2016	FY 2017	FY 2017	acct / Description	FY 2014	FY 2015	FY 2016	FY 2016	FY 2017	FY 2017	Forecast	
				REVENUES								
$6,850.1	$6,932.4	$6,873.5	$7,168.3	31 Membership Dues Earned Income	$7,178.7	$7,281.8	$7,595.7	$7,481.7	$7,549.6	$7,828.6	($279.0)	Membership growth primarily students - not Full/Associate Members.
1,020.0	1,100.7	1,557.0	1,340.1	35.1 Meeting & Seminar Income	1,965.7	1,578.5	1,737.5	1,529.9	2,206.6	1,968.5	$238.1	Primarily related to Winter Meeting record breaking attendance
80.5	8.4	21.7	8.4	38 Contribution Income	25.6	38.4	8.4	92.1	18.7	18.7	$0.0	
20.0	20.4	20.0	20.3	41.2 Contributions and Matching Gifts	20.0	20.0	20.4	20.0	20.3	20.3	$0.0	
114.2	79.2	114.3	89.8	46 Miscellaneous Income	103.0	153.3	83.6	117.9	139.7	99.7	$40.0	
8,084.8	**8,141.1**	**8,586.5**	**8,626.9**	**TOTAL REVENUES**	**9,293.0**	**9,072.0**	**9,445.6**	**9,241.6**	**9,934.9**	**9,935.8**		
				EXPENSES:								
1,203.2	1,242.9	1,216.0	1,242.3	51 Salary Expense	1,175.4	1,135.0	1,243.3	1,330.7	1,369.7	1,369.7	$0.0	
341.0	328.2	327.8	363.0	52 Payroll Taxes, Benefits, Personnel Exp	342.6	313.7	328.3	404.7	399.0	399.0	$0.0	
362.2	374.3	314.2	302.1	61 Publishing and Promotion Expense	339.3	422.2	404.5	398.0	313.6	313.6	$0.0	
1,130.7	1,641.4	1,296.8	1,470.6	64 Meetings & Conferences Expense	1,841.9	1,644.0	1,740.7	1,658.4	1,913.2	2,103.3	($190.1)	Lower than anticipated conference expenses for several meetings in 17-16
513.2	687.1	588.7	692.2	66 Travel Expense	667.6	668.7	731.9	625.0	845.7	843.6	$2.1	
83.4	95.5	73.7	83.0	68 Awards, Certif, Logo Cost of Goods Sold	76.6	82.8	108.8	80.0	86.0	86.0	$0.0	
114.4	121.6	113.8	123.2	71 Research Projects & Grants Expense	99.4	93.7	119.6	114.4	123.2	123.2	$0.0	
302.2	317.1	315.3	345.9	82 Office Expense and Organizational Dues	330.0	299.4	359.4	319.9	370.3	370.3	$0.0	
154.0	173.2	172.9	230.2	84 Outside Services Expense	178.1	175.2	178.4	195.6	253.5	278.5	($25.0)	
242.0	243.4	288.8	282.1	88 Other Expense	259.2	294.1	246.1	285.9	316.2	323.2	($7.0)	
(137.3)		(193.2)		88.1 Prepaid Expense (contra acct)	2.0	13.5		(8.8)			$0.0	
		140.0	140.0	89 Opportunity Fund					140.0	140.0	$0.0	
1,547.4	1,829.6	1,686.1	1,776.9	91 Allocation of Overhead & BOD	1,603.9	1,657.9	1,829.6	1,736.4	1,792.1	1,966.7		
5,856.4	**7,054.3**	**6,340.9**	**7,051.5**	**TOTAL EXPENSES**	**6,916.0**	**6,800.2**	**7,290.6**	**7,140.2**	**7,922.5**	**8,317.1**		
2,228.4	1,086.8	2,245.6	1,575.4	SURPLUS (DEFICIT) before reserve income	2,377.0	2,271.8	2,155.0	2,101.4	2,012.4	1,618.7		

ASHRAE
PUBLISHING & EDUCATION COUNCIL (2-4nn & 5-5nn)
Major Variations
For the Eleven Months Ending Wednesday, May 31, 2017

Fiscal YTD Through Month of May					TWELVE MONTHS ENDING JUNE 30						Variance	
Actual	Budget	Actual	Budget		Actual	Actual	Budget	Actual	Forecast	Budget	Budget vs.	Comments
FY 2016	FY 2016	FY 2017	FY 2017	acct / Description	FY 2014	FY 2015	FY 2016	FY 2016	FY 2017	FY 2017	Forecast	
				REVENUES								
$3,324.9	$3,489.9	$3,139.1	$3,565.4	32 Publication Sales Income	$3,803.6	$3,483.9	$3,585.5	$3,626.1	$3,528.8	$3,924.8	($396.0)	Income down for the year across all book and non-print publication categories. Pub/Ed looking at promotional opportunites.
3,555.3	3,475.1	3,324.3	3,610.2	34 Advertising Income - Display	3,773.1	3,710.8	3,761.0	3,779.4	3,613.1	3,846.0	($232.9)	Some shifting from print to online advertising as print/digital sales increase
17.6	24.0	16.9	22.8	34 Advertising Income - Classified	26.5	32.0	25.0	19.3	18.0	25.0	($7.0)	
638.6	576.2	758.2	654.5	34 Advertising Income - On-line	470.4	595.6	640.0	715.8	845.0	720.0	$125.0	Additional online opportunities being made available.
163.9	205.6	181.4	218.4	35.2 Certification Registration	148.5	183.3	220.0	187.6	210.0	250.0		
1,659.2	1,392.6	1,414.0	1,832.6	35.3 Education Registration	1,301.6	1,504.5	1,585.0	1,844.8	1,610.0	2,060.0		
				37 Special Project Income	45.0	230.0					$0.0	
10.1	11.9	7.6	12.1	38 Contribution Income	17.0	10.8	13.9	12.1	14.3	14.3	$0.0	
95.0	97.0	50.0	98.6	41.2 Contributions and Matching Gifts	110.0	95.0	97.0	95.0	95.0	98.6	($3.6)	
163.9	148.1	127.2	174.4	46 Miscellaneous Income	195.3	143.1	155.2	184.4	175.9	186.8	($10.9)	
9,628.5	**9,420.4**	**9,018.7**	**10,189.0**	**TOTAL REVENUES**	**9,891.0**	**9,989.0**	**10,082.6**	**10,464.5**	**10,110.1**	**11,125.5**		
				EXPENSES:								
2,197.0	2,364.0	2,165.0	2,216.8	51 Salary Expense	2,232.8	2,218.4	2,364.0	2,411.7	2,411.7	2,434.9	($23.2)	
666.5	664.6	680.9	673.1	52 Payroll Taxes, Benefits, Personnel Exp	717.3	706.0	673.2	780.7	776.4	756.3	$20.1	
2,778.6	3,016.9	2,445.7	2,842.3	61 Publishing and Promotion Expense	3,105.4	3,302.7	3,133.0	3,331.8	2,963.0	3,258.1	($295.1)	Reduced product sales translates into decreased expenditures (printing, COGS, shipping, commissions, etc.)
458.4	372.1	443.8	504.2	64 Meetings & Conferences Expense	354.7	451.6	426.8	564.6	586.6	560.0	$26.6	
89.2	165.8	118.9	154.5	66 Travel Expense	196.9	178.4	187.1	137.8	180.0	205.7	($25.7)	
(0.3)	2.3	0.6	2.3	68 Awards, Certif, Logo Cost of Goods Sold	0.8	1.0	2.5	0.8	2.6	2.6	$0.0	
		0.5		76 Public Relations Expense							$0.0	
38.1	43.2	36.4	38.4	78 Occupancy & Insurance	36.3	36.1	40.1	40.6	41.3	41.3		
840.5	805.1	752.6	800.9	82 Office Expense and Organizational Dues	894.2	963.5	969.4	1,036.6	919.4	1,027.5		
670.6	976.5	793.3	1,086.8	84 Outside Services Expense	744.5	817.2	1,054.3	938.3	1,266.9	1,291.3		
275.6	156.2	132.8	193.7	88 Other Expense	143.7	108.1	162.5	227.7	165.7	163.6		
				90 Depreciation Expense	61.0	45.8						
2,829.1	3,478.9	2,996.9	3,449.6	91 Allocation of Overhead & BOD	3,048.4	3,237.1	3,478.9	3,147.3	3,451.0	3,787.1		
10,843.3	**12,045.6**	**10,567.4**	**11,962.6**	**TOTAL EXPENSES**	**11,536.0**	**12,065.9**	**12,491.8**	**12,617.9**	**12,764.6**	**13,528.4**		
(1,214.8)	(2,625.2)	(1,548.7)	(1,773.6)	SURPLUS (DEFICIT) before reserve income	(1,645.0)	(2,076.9)	(2,409.2)	(2,153.4)	(2,654.5)	(2,402.9)		

ASHRAE
TECHNOLOGY COUNCIL
Major Variations
For the Eleven Months Ending Wednesday, May 31, 2017

Fiscal YTD Through Month of May					TWELVE MONTHS ENDING JUNE 30						Variance	
Actual	Budget	Actual	Budget		Actual	Actual	Budget	Actual	Forecast	Budget	Budget vs.	Comments
FY 2016	FY 2016	FY 2017	FY 2017	acct / Description	FY 2014	FY 2015	FY 2016	FY 2016	FY 2017	FY 2017	Forecast	
				REVENUES								
$3.2		$14.3		37 Special Project Income	$5.0	$86.6		$3.2	$45.0		$45.0	
13.0	24.3	23.3	23.8	46 Miscellaneous Income	17.0	12.2	25.3	15.0	26.0	26.0	$0.0	
16.2	**24.3**	**37.6**	**23.8**	**TOTAL REVENUES**	**22.0**	**98.8**	**25.3**	**18.2**	**71.0**	**26.0**		
				EXPENSES:								
1,027.7	1,123.5	1,089.2	966.7	51 Salary Expense	1,060.1	1,108.7	1,123.5	1,125.8	1,068.9	1,060.9		
292.1	296.6	292.3	279.3	52 Payroll Taxes, Benefits, Personnel Exp	296.7	322.2	296.6	322.8	307.0	304.6		
0.0	0.7	0.5	2.2	61 Publishing and Promotion Expense	5.5	0.8	2.2	0.3	2.3	2.3	$0.0	
8.7	19.0	15.8	20.8	64 Meetings & Conferences Expense	11.3	8.2	19.8	8.8	20.6	21.2	($0.6)	
70.3	141.4	123.3	138.0	66 Travel Expense	163.2	132.5	147.4	93.2	197.1	176.1	$21.0	
0.3	1.6	0.1	1.6	68 Awards, Certif, Logo Cost of Goods Sold	0.4	0.3	1.6	0.3	1.6	1.6	$0.0	
81.3	100.8	153.0	162.0	73 Special Projects Expense	50.0	72.5	110.0	101.3	218.5	162.0	$56.5	
	2.2		2.3	76 Public Relations Expense			2.4		2.5	2.5	$0.0	
88.8	109.3	93.2	119.3	82 Office Expense and Organizational Dues	109.0	90.1	109.5	88.9	120.7	120.7	$0.0	
35.1	49.4	9.2	49.1	84 Outside Services Expense	57.5	2.8	53.7	39.3	54.1	55.3	($1.2)	
0.0	0.1		0.1	88 Other Expense			0.1	0.0	0.1	0.1	$0.0	
				88.1 Prepaid Expense (contra acct)	(20.3)	20.3						
19.2		0.0		90 Depreciation Expense	27.0	27.0		19.2				
1,321.7	1,653.2	1,497.3	1,644.8	91 Allocation of Overhead & BOD	1,442.7	1,621.0	1,653.2	1,467.2	1,638.2	1,797.8		
2,945.2	**3,497.8**	**3,273.9**	**3,386.2**	**TOTAL EXPENSES**	**3,203.1**	**3,406.4**	**3,520.0**	**3,267.1**	**3,631.6**	**3,705.1**		
(2,929.0)	(3,473.5)	(3,236.3)	(3,362.4)	SURPLUS (DEFICIT) before reserve income	(3,181.1)	(3,307.6)	(3,494.7)	(3,248.9)	(3,560.6)	(3,679.1)		

ASHRAE
RESEARCH (funds 3 & 4)
Major Variations
For the Eleven Months Ending Wednesday, May 31, 2017

Fiscal YTD Through Month of May					TWELVE MONTHS ENDING JUNE 30						Variance	
Actual	Budget	Actual	Budget	roll up	Actual	Actual	Budget	Actual	Forecast	Budget	Budget vs.	Comments
FY 2016	FY 2016	FY 2017	FY 2017	acct / Description	FY 2014	FY 2015	FY 2016	FY 2016	FY 2017	FY 2017	Forecast	
				REVENUES								
$139.8	$154.5	$140.3	$143.6	31 Membership Dues Earned Income	$146.6	$148.7	$154.5	$152.7	$156.8	$156.8	$0.0	
				37 Special Project Income	55.0						$0.0	
1,272.6	1,276.0	1,280.3	1,421.0	38 Contribution Income	1,898.4	2,000.2	2,219.0	2,046.7	2,319.8	2,294.8	$25.0	
1,898.4	1,898.4	2,000.0	2,000.2	41.2 Contributions and Matching Gifts	1,989.2	1,814.5	1,898.4	1,898.4	2,000.0	2,000.2	($0.2)	
235.5	243.0	568.3	1,290.7	44 Reserve Transfers	536.3	571.2	243.0	256.9	568.3	1,408.0	($839.7)	Only $360K of $1.2M A2L Project Budget spent in 16-1
0.0	3.0		3.1	46 Miscellaneous Income	(1.1)		3.3	0.0	3.4	3.4	$0.0	
3,546.3	**3,574.9**	**3,988.9**	**4,858.6**	**TOTAL REVENUES**	**4,624.4**	**4,534.6**	**4,518.2**	**4,354.7**	**5,048.3**	**5,863.2**		
				EXPENSES:								
523.2	570.8	519.8	512.4	51 Salary Expense	535.7	553.8	570.8	575.2	563.3	563.3	$0.0	
150.4	150.7	140.5	148.1	52 Payroll Taxes, Benefits, Personnel Exp	152.4	160.9	150.7	157.3	161.8	161.8	$0.0	
41.1	93.8	27.9	87.8	61 Publishing and Promotion Expense	44.4	19.4	103.4	41.3	104.2	104.2	$0.0	
26.0	16.4	30.1	16.9	64 Meetings & Conferences Expense	6.5	20.7	16.9	27.0	21.4	17.4	$4.0	
68.6	122.2	86.4	110.8	66 Travel Expense	127.6	119.1	131.4	84.0	128.9	132.3	($3.4)	
37.1	32.4	47.0	33.4	68 Awards, Certif, Logo Cost of Goods Sold	32.7	35.6	32.7	37.4	33.6	33.6	$0.0	
1,719.9	2,416.3	1,801.2	2,154.4	71 Research Projects & Grants Expense	2,543.0	2,368.7	2,550.5	2,199.4	3,088.2	3,822.2	($734.0)	Only $360K of $1.2M A2L Project Budget spent in 16-1
	0.2		0.2	76 Public Relations Expense			0.2		0.2	0.2	$0.0	
40.5	52.9	42.7	50.0	82 Office Expense and Organizational Dues	42.9	52.1	57.3	45.7	56.7	58.0	($1.3)	
4.8				84 Outside Services Expense		4.8		(4.8)			$0.0	
36.9	64.1	36.1	48.9	88 Other Expense	46.1	43.0	64.3	50.4	66.2	66.2	$0.0	
672.9	840.0	725.7	821.9	91 Allocation of Overhead & BOD	730.0	808.5	840.0	750.3	823.7	903.9		
3,321.4	**4,359.8**	**3,457.4**	**3,984.8**	**TOTAL EXPENSES**	**4,261.3**	**4,186.6**	**4,518.2**	**3,963.2**	**5,048.2**	**5,863.1**		
224.9	(784.9)	531.5	873.8	SURPLUS (DEFICIT) before reserve income	363.1	348.0	0.0	391.5	0.1	0.1		

ASHRAE
GENERAL (Fund 2)
FY 17-18 Budget
For the Eleven Months Ending Wednesday, May 31, 2017

	TWELVE MONTHS ENDING JUNE 30				DRAFT	Variance	
	Actual	Actual	Actual	Forecast	Budget	Budget vs.	Comments
acct / Description	FY 2014	FY 2015	FY 2016	FY 2017	FY 2018	Forecast	
REVENUES							
31 Membership Dues Earned Income	$7,178.7	$7,281.8	$7,481.7	$7,549.6	$7,732.0	182.4	1% increase in dues; exploring retention/recruitment strategies
32 Publication Sales Income	3,803.6	3,483.9	3,626.1	3,528.8	3,700.1	171.3	Pub/Ed exploring new opportunities for digital subscriptions and promotional opportunites for existing products.
34 Advertising Income - Display	3,773.1	3,710.8	3,779.4	3,613.1	3,658.2	45.1	
34 Advertising Income - Classified	26.5	32.0	19.3	18.0	25.0	7.0	
34 Advertising Income - On-line	470.4	595.6	715.8	845.0	870.0	25.0	
35.1 Meeting & Seminar Income	1,965.7	1,578.5	1,529.9	2,206.6	1,889.3	(317.3)	Lower attendance expected for Winter Meeting (Chicago '17-18 vs. Las Vegas '16-17)
35.2 Certification Registration	148.5	183.3	187.6	210.0	220.0	10.0	
35.3 Education Registration	1,301.6	1,504.5	1,844.8	1,610.0	1,955.0	345.0	Educational Programs demand should return to '15-16 levels after eLearning portal was offline and dealing with some disruptions in '16-17
37 Special Project Income	50.0	316.6	3.2	45.0	50.0	5.0	
38 Contribution Income	47.2	72.7	104.2	41.0	42.3	1.3	
41.1 AHR Exposition Income	3,973.0	5,146.6	5,168.0	5,624.0	5,802.5	178.5	Early results show Chicago surpassing Las Vegas for largest Expo in history
41.2 Contributions and Matching Gifts	(1,859.2)	(1,699.5)	(1,841.4)	(1,862.7)	(1,950.5)	(87.8)	
41.3 Exposition Income - Other Countries		145.9	34.0	162.3		(162.3)	No Expo in Mexico in FY17-18
44 Reserve Transfers	489.2	314.5	398.4	421.4	719.0		
46 Miscellaneous Income	341.9	534.4	322.7	373.6	544.9		
TOTAL REVENUES	**21,710.2**	**23,201.6**	**23,373.7**	**24,385.7**	**25,257.8**		
EXPENSES:							
51 Salary Expense	6,988.0	7,357.2	8,205.5	8,258.7	8,766.0	507.3	Salary increases (annual); full year of new headcount added during 16-17
52 Payroll Taxes, Benefits, Personnel Exp	2,119.3	2,375.3	2,581.5	2,471.4	2,657.2	185.8	Primarily related to large increase in medical insurance premiums and increase in taxes related to higher salaries
61 Publishing and Promotion Expense	3,524.7	3,757.5	3,786.5	3,492.9	3,483.2	(9.7)	
64 Meetings & Conferences Expense	2,286.6	2,178.5	2,335.7	2,617.8	2,674.6	56.8	
66 Travel Expense	2,138.0	1,954.6	1,776.0	2,184.6	2,398.6	214.0	Primarily related to Society (17-18) and Strategic Plan Initiatives; DRC travel to other CRC; GGAC - "Day on the Hill" travel
68 Awards, Certif, Logo Cost of Goods Sold	86.9	98.9	90.9	120.0	129.8	9.8	
71 Research Projects & Grants Expense	106.5	100.9	121.7	131.3	136.6	5.3	
73 Special Projects Expense	50.0	72.5	101.3	218.5	157.5	(61.0)	
76 Public Relations Expense	129.1	51.0	79.4	63.9	89.9	26.0	
78 Occupancy & Insurance	563.4	559.2	588.6	595.7	644.5	48.8	Special Events Insurance Coverage - Chapters/Regions ($25K)
82 Office Expense and Organizational Dues	1,704.0	1,788.1	1,815.0	1,833.0	1,940.0	107.0	Society Initiatives
84 Outside Services Expense	1,528.0	1,654.6	1,717.7	2,355.4	2,476.0	120.6	$200K Globalization initiative (placeholder); Society Initiatives
88 Other Expense	496.8	487.8	623.2	599.4	610.5	11.1	
88.1 Prepaid Expense (contra acct)	(18.3)	33.8	(560.5)	(475.0)	(500.0)	(25.0)	
89 Opportunity Fund	35.0	35.5		140.0	240.0	100.0	Society ($100K) and Chapter ($140K) Opportunity Funds
90 Depreciation Expense	660.9	631.9	579.3	534.7	640.7	106.0	$600K in CapEx approved in 16-17
91 Allocation of Overhead & BOD	(730.0)	(808.5)	(750.3)	(823.7)	(985.9)		
TOTAL EXPENSES	**21,668.9**	**22,328.8**	**23,091.5**	**24,318.6**	**25,559.2**		
SURPLUS (DEFICIT) before reserve income	41.3	872.8	282.2	67.1	(301.4)		
91.5 Headquarters Building Renewal Contributions	0.3						
92 Non-recurring Expenses	474.8	639.5	477.9	75.0	210.0		

ASHRAE
BOARD OF DIRECTORS 2-5nn
FY 17-18 Budget
For the Eleven Months Ending Wednesday, May 31, 2017

	TWELVE MONTHS ENDING JUNE 30				**DRAFT**	**Variance**	
	Actual	Actual	Actual	Forecast	**Budget**	**Budget vs.**	**Comments**
acct / Description	FY 2014	FY 2015	FY 2016	FY 2017	**FY 2018**	**Forecast**	
REVENUES							
38 Contribution Income	$4.5	$23.5		$8.0	$8.3	0.3	
41.2 Contributions and Matching Gifts			0.0	80.0	0.0	(80.0)	
44 Reserve Transfers						-	
46 Miscellaneous Income	2.5	273.0	0.3		43.0	43.0	
TOTAL REVENUES	**7.0**	**296.5**	**0.3**	**88.0**	**51.3**		
EXPENSES:							
51 Salary Expense	735.7	972.4	811.0	892.5	1,002.7	110.2	Full year of new headcount (Development/Fundraising) in 17-18 hired in 16-17
52 Payroll Taxes, Benefits, Personnel Exp	214.4	272.0	245.1	251.7	270.0	18.3	
61 Publishing and Promotion Expense	69.4	10.0	26.9	108.1	124.6	16.5	
64 Meetings & Conferences Expense	71.0	64.0	83.8	83.7	99.6	15.9	
66 Travel Expense	1,017.9	887.9	782.6	815.1	1,024.1	209.0	Primarily related to Society (17-18) and Strategic Plan Initiatives; DRC travel to other CRC
68 Awards, Certif, Logo Cost of Goods Sold	9.1	14.9	9.9	3.8	3.9	0.1	
71 Research Projects & Grants Expense	7.1	7.2	7.3	8.1	8.4	0.3	
76 Public Relations Expense	1.2	0.1				-	
82 Office Expense and Organizational Dues	42.6	60.5	16.5	44.4	49.9	5.5	
84 Outside Services Expense	69.2	204.6	73.2	276.2	317.8	41.6	
88 Other Expense	0.5	1.9	7.0	7.7	2.8	(4.9)	
88.1 Prepaid Expense (contra acct)			0.0	0.0	0.0	-	
89 Opportunity Fund	35.0	35.5			100.0	100.0	Society Opportunity Fund
90 Depreciation Expense	4.1	3.2	0.2		65.0	65.0	Related to Building EQ Portal
91 Allocation of Overhead & BOD	(2,277.4)	(2,534.2)	(2,063.5)	(2,491.3)	(3,068.8)		
TOTAL EXPENSES		**0.0**	**0.0**	**0.0**	**0.0**		
SURPLUS (DEFICIT) before reserve income	7.0	296.5	0.3	88.0	51.3		

ASHRAE
MEMBERS COUNCIL (2-2nn & 2-8nn)
FY 17-18 Budget
For the Eleven Months Ending Wednesday, May 31, 2017

	TWELVE MONTHS ENDING JUNE 30				DRAFT	Variance	
	Actual	Actual	Actual	Forecast	Budget	Budget vs.	Comments
acct / Description	FY 2014	FY 2015	FY 2016	FY 2017	FY 2018	Forecast	
REVENUES							
31 Membership Dues Earned Income	$7,178.7	$7,281.8	$7,481.7	$7,549.6	$7,732.0	182.4	1% increase in dues; looking at retention/recruitment strategies
35.1 Meeting & Seminar Income	1,965.7	1,578.5	1,529.9	2,206.6	1,889.3	(317.3)	Lower attendance expected for Winter Meeting (Chicago '17-18 vs. Las Vegas '16-17)
38 Contribution Income	25.6	38.4	92.1	18.7	19.0	0.3	
41.2 Contributions and Matching Gifts	20.0	20.0	20.0	20.3	20.7	0.4	
46 Miscellaneous Income	103.0	153.3	117.9	139.7	112.6		
TOTAL REVENUES	**9,293.0**	**9,072.0**	**9,241.6**	**9,934.9**	**9,773.6**		
EXPENSES:							
51 Salary Expense	1,175.4	1,135.0	1,330.7	1,369.7	1,455.7	86.0	
52 Payroll Taxes, Benefits, Personnel Exp	342.6	313.7	404.7	399.0	406.7	7.7	
61 Publishing and Promotion Expense	339.3	422.2	398.0	313.6	334.1	20.5	
64 Meetings & Conferences Expense	1,841.9	1,644.0	1,658.4	1,913.2	1,957.1	43.9	
66 Travel Expense	667.6	668.7	625.0	845.7	878.7	33.0	
68 Awards, Certif, Logo Cost of Goods Sold	76.6	82.8	80.0	86.0	94.4	8.4	
71 Research Projects & Grants Expense	99.4	93.7	114.4	123.2	128.2	5.0	
82 Office Expense and Organizational Dues	330.0	299.4	319.9	370.3	435.6	65.3	
84 Outside Services Expense	178.1	175.2	195.6	253.5	248.0	(5.5)	
88 Other Expense	259.2	294.1	285.9	316.2	319.5	3.3	
88.1 Prepaid Expense (contra acct)	2.0	13.5	(8.8)			-	
89 Opportunity Fund				140.0	140.0	-	
91 Allocation of Overhead & BOD	1,603.9	1,657.9	1,736.4	1,792.1	1,915.3		
TOTAL EXPENSES	**6,916.0**	**6,800.2**	**7,140.2**	**7,922.5**	**8,313.3**		
SURPLUS (DEFICIT) before reserve income	2,377.0	2,271.8	2,101.4	2,012.4	1,460.3		

ASHRAE
PUBLISHING & EDUCATION COUNCIL (2-4nn & 5-5nn)
FY 17-18 Budget
For the Eleven Months Ending Wednesday, May 31, 2017

	TWELVE MONTHS ENDING JUNE 30				DRAFT	Variance	
	Actual	Actual	Actual	Forecast	Budget	Budget vs.	Comments
acct / Description	FY 2014	FY 2015	FY 2016	FY 2017	FY 2018	Forecast	
REVENUES							
32 Publication Sales Income	$3,803.6	$3,483.9	$3,626.1	$3,528.8	$3,700.1	171.3	Pub/Ed exploring new opportunities for digital subscriptions and promotional opportunites for existing products.
34 Advertising Income - Display	3,773.1	3,710.8	3,779.4	3,613.1	3,658.2	45.1	
34 Advertising Income - Classified	26.5	32.0	19.3	18.0	25.0	7.0	
34 Advertising Income - On-line	470.4	595.6	715.8	845.0	870.0	25.0	
35.2 Certification Registration	148.5	183.3	187.6	210.0	220.0	10.0	
35.3 Education Registration	1,301.6	1,504.5	1,844.8	1,610.0	1,955.0	345.0	Educational Programs demand should return to '15-16 levels after eLearning portal was offline and dealing with some disruptions in '16-17
37 Special Project Income	45.0	230.0				-	
38 Contribution Income	17.0	10.8	12.1	14.3	14.9	0.6	
41.2 Contributions and Matching Gifts	110.0	95.0	95.0	95.0	86.8	(8.2)	
46 Miscellaneous Income	195.3	143.1	184.4	175.9	177.5	1.6	
TOTAL REVENUES	**9,891.0**	**9,989.0**	**10,464.5**	**10,110.1**	**10,707.5**		
EXPENSES:							
51 Salary Expense	2,232.8	2,218.4	2,411.7	2,411.7	2,468.4	56.7	
52 Payroll Taxes, Benefits, Personnel Exp	717.3	706.0	780.7	776.4	742.1	(34.3)	
61 Publishing and Promotion Expense	3,105.4	3,302.7	3,331.8	2,963.0	2,910.7	(52.3)	
64 Meetings & Conferences Expense	354.7	451.6	564.6	586.6	582.2	(4.4)	
66 Travel Expense	196.9	178.4	137.8	180.0	194.0	14.0	
68 Awards, Certif, Logo Cost of Goods Sold	0.8	1.0	0.8	2.6	2.7	0.1	
76 Public Relations Expense						-	
78 Occupancy & Insurance	36.3	36.1	40.6	41.3	42.9	1.6	
82 Office Expense and Organizational Dues	894.2	963.5	1,036.6	919.4	942.2	22.8	
84 Outside Services Expense	744.5	817.2	938.3	1,266.9	1,281.4	14.5	
88 Other Expense	143.7	108.1	227.7	165.7	171.7	6.0	
90 Depreciation Expense	61.0	45.8					
91 Allocation of Overhead & BOD	3,048.4	3,237.1	3,147.3	3,451.0	4,057.5		
TOTAL EXPENSES	**11,536.0**	**12,065.9**	**12,617.9**	**12,764.6**	**13,395.8**		
SURPLUS (DEFICIT) before reserve income	(1,645.0)	(2,076.9)	(2,153.4)	(2,654.5)	(2,688.3)		

ASHRAE
TECHNOLOGY COUNCIL
FY 17-18 Budget
For the Eleven Months Ending Wednesday, May 31, 2017

	TWELVE MONTHS ENDING JUNE 30				DRAFT	Variance	
	Actual	Actual	Actual	Forecast	Budget	Budget vs.	Comments
acct / Description	FY 2014	FY 2015	FY 2016	FY 2017	FY 2018	Forecast	
REVENUES							
37 Special Project Income	$5.0	$86.6	$3.2	$45.0	$50.0	5.0	
46 Miscellaneous Income	17.0	12.2	15.0	26.0	27.1	1.1	
TOTAL REVENUES	**22.0**	**98.8**	**18.2**	**71.0**	**77.1**		
EXPENSES:							
51 Salary Expense	1,060.1	1,108.7	1,125.8	1,068.9	1,154.5		
52 Payroll Taxes, Benefits, Personnel Exp	296.7	322.2	322.8	307.0	316.5		
61 Publishing and Promotion Expense	5.5	0.8	0.3	2.3	2.4	0.1	
64 Meetings & Conferences Expense	11.3	8.2	8.8	20.6	21.5	0.9	
66 Travel Expense	163.2	132.5	93.2	197.1	191.6	(5.5)	
68 Awards, Certif, Logo Cost of Goods Sold	0.4	0.3	0.3	1.6	1.7	0.1	
73 Special Projects Expense	50.0	72.5	101.3	218.5	157.5	(61.0)	
76 Public Relations Expense				2.5	2.6	0.1	
82 Office Expense and Organizational Dues	109.0	90.1	88.9	120.7	126.5	5.8	
84 Outside Services Expense	57.5	2.8	39.3	54.1	74.4	20.3	
88 Other Expense			0.0	0.1	0.1	-	
88.1 Prepaid Expense (contra acct)	(20.3)	20.3				-	
90 Depreciation Expense	27.0	27.0	19.2			-	
91 Allocation of Overhead & BOD	1,442.7	1,621.0	1,467.2	1,638.2	1,800.6		
TOTAL EXPENSES	**3,203.1**	**3,406.4**	**3,267.1**	**3,631.6**	**3,849.9**		
SURPLUS (DEFICIT) before reserve income	(3,181.1)	(3,307.6)	(3,248.9)	(3,560.6)	(3,772.8)		

ASHRAE
RESEARCH (funds 3 & 4)
FY 17-18 Budget
For the Eleven Months Ending Wednesday, May 31, 2017

	TWELVE MONTHS ENDING JUNE 30				**DRAFT**	**Variance**	
roll up	Actual	Actual	Actual	Forecast	**Budget**	**Budget vs.**	**Comments**
acct / Description	FY 2014	FY 2015	FY 2016	FY 2017	**FY 2018**	**Forecast**	
REVENUES							
31 Membership Dues Earned Income	$146.6	$148.7	$152.7	$156.8	$157.0	0.2	
37 Special Project Income	55.0					-	
38 Contribution Income	1,898.4	2,000.2	2,046.7	2,319.8	2,398.5	78.7	
41.2 Contributions and Matching Gifts	1,989.2	1,814.5	1,898.4	2,000.0	2,000.0	-	
44 Reserve Transfers	536.3	571.2	256.9	568.3	1,049.7	481.4	Primarily due to majority of A2L refrigerant work to be completed in 17-18
46 Miscellaneous Income	(1.1)		0.0	3.4	3.5	0.1	
TOTAL REVENUES	**4,624.4**	**4,534.6**	**4,354.7**	**5,048.3**	**5,608.7**		
EXPENSES:							
51 Salary Expense	535.7	553.8	575.2	563.3	594.6	31.3	
52 Payroll Taxes, Benefits, Personnel Exp	152.4	160.9	157.3	161.8	164.9	3.1	
61 Publishing and Promotion Expense	44.4	19.4	41.3	104.2	105.4	1.2	
64 Meetings & Conferences Expense	6.5	20.7	27.0	21.4	18.1	(3.3)	
66 Travel Expense	127.6	119.1	84.0	128.9	137.2	8.3	
68 Awards, Certif, Logo Cost of Goods Sold	32.7	35.6	37.4	33.6	35.0	1.4	
71 Research Projects & Grants Expense	2,543.0	2,368.7	2,199.4	3,088.2	3,438.2	350.0	Primarily due to majority of A2L refrigerant work to be completed in 17-18
76 Public Relations Expense				0.2	0.3	0.1	
82 Office Expense and Organizational Dues	42.9	52.1	45.7	56.7	60.3	3.6	
84 Outside Services Expense		4.8	(4.8)			-	
88 Other Expense	46.1	43.0	50.4	66.2	68.9	2.7	
91 Allocation of Overhead & BOD	730.0	808.5	750.3	823.7	985.9		
TOTAL EXPENSES	**4,261.3**	**4,186.6**	**3,963.2**	**5,048.2**	**5,608.8**		
SURPLUS (DEFICIT) before reserve income	363.1	348.0	391.5	0.1	(0.1)		

REPORT TO BOARD OF DIRECTORS
From Finance Committee
As of June 23, 2017

Recommendations for BOD Approval:

1. Motion: Finance Committee recommends to the Board of Directors that the 2017-18 draft budget for the General Fund, inclusive of council budgets, showing a total deficit of $301,400 be approved.

   Background: Finance Committee makes its recommendation based on a three year budget cycle. Member programs can then be included in each budget year despite fluctuations in revenue streams, such as Expo royalties, continuous maintenance standards and the volume of the ASHRAE Handbook published in a given year. For 2016-17, 2017-18 and 2019-20 the surpluses/(deficits) are $67,100, and ($301,400), and ($224,900), respectively. The surplus/(deficit) for the three years combined nets a deficit of ($459,200). The committee will continue to look at the budgets in two to three year increments watching trends and cycles to balance protection of Society's assets with providing member benefits. (Motion passed 7-0-0 CNV)

2. Motion: Finance Committee recommends to the Board of Directors that the 2017-18 draft budget for the Research Fund showing total revenues and expenses of $5,608,800 be approved.

   Background: The Research Fund proposed budget includes a transfer of 4% of the Research Reserve Fund portfolio value of as of 6/30/16, based on the needs of Research Administration Committee. The Rules of the Board require a minimum transfer of 4% of the portfolio value, and the Finance Committee may recommend a higher percentage up to 10% of the Research Reserve Fund portfolio value provided that the assets in the Research Reserve Fund are at least equal to the annual Research Fund expenditures. (Motion passed 7-0-0, CNV)

3. Motion: Finance Committee recommends to the Board of Directors that they approve a discretionary capital expenditure budget of $200,000 for fiscal year 2017-18. Finance Committee also recommends to the Board of Directors that they approve an additional $150,000 for upgrading Society's Association Management software.

   Background: In regards to the discretionary capital budget for normal operations, this has been historically set at $200,000. In regards to the update/upgrade of Society's Association Management software, netForum, this system has not been updated in over six years. This update will not only bring the system to the 2017 version (currently using 2011 version) but will add functionality and numerous system enhancements. (Motion passed 7-0-0, CNV)

4. Motion: The Finance Committee recommends to the Board of Directors that the Rules of the Board (ROB), Volume 3, Manuals and Procedures, 3.200 Dues, Fees; 3.200.001, Society Dues, through 3.200.007, Student Member Transfer, be revised per Attachment A to this report.

   Background: The annual dues renewal process currently includes the need to revise the Rules of the Board on an annual basis to update dues rates listed therein. The intent of this motion is to eliminate that practice which the Society Rules Committee recommends. The current process involves the Finance Committee making recommendations for membership dues rates to the BOD which then considers this recommendation and approves the dues rate for the upcoming year. This process is not being changed. (Motion passed 7-0-0, CNV)

   Fiscal Impact: None.

5. Motion: Finance Committee recommends to the Board of Directors that they approve opening a new bank account in Dubai, UAE.

   Background: ASHRAE successfully opened a training center in Dubai and has signed an annual services agreement with the Dubai Association Centre for an office in their facility. We have also hired an individual that will handle all of the administrative tasks that will be needed to run this training center. A new bank account is needed to assist in making deposits of any currency received, processing small disbursements, and should give ASHRAE the ability to process credit card transactions for training courses in the local currency. Handling the banking from ASHRAE's primary bank in the U.S. (SunTrust) would create delays and process issues for the local staff in Dubai. The Comptroller will put processes in place to limit Society risk such as spending limits on debit cards and having ASHRAE HQ Accounting staff process large payments and reconcile bank account activity monthly. Per the Rules of the Board 2.102.002.5 Bank Accounts, the authorization to establish a bank account shall require approval of the Board of Directors. (Motion passed 7-0-0 CNV)

   Fiscal Impact: Negligible

6. Motion: The Finance Committee recommends to the Board of Directors that the Rules of the Board (ROB), Volume 1, Principles and Policies, 1.201.027 Travel Reimbursement Policy, Article 1.201.027.3, Applicability, be updated to reflect a proposed revision to DRC's, DRC Nominee's and DAL's reimbursement for participation in CRC's per Attachment B to this report.

   Background**:**
   1. In the past year a DRC, or DRC Nominee, indicated that lacking full "Travel" reimbursement, as opposed to the current policy of "Transportation" only reimbursement, for attending CRC's, specifically in other regions (to learn how other regions conduct their CRC's), would hinder, or limit, their desire to attend CRC's outside of their region for this purpose.
   2. An initial Motion was generated by Member's Council to address this suggestion, that visiting DRC's and DRC Nominee's to CRC's (other than in their own region) receive "Travel" versus "Transportation" reimbursement. The "DRC Council" has also been considering related revisions.
   3. There has been much discussion among current DRC's, Members Council and staff relating to this Motion and various iterations of the Motion have since been developed which expanded the motion to include Host DRC's and DAL's (attending CRC's within their own region).
   4. Some additional verbiage has been suggested to be added to suggest that these trips should be approved in advance by the Society President; should be President-Elect (which indirectly occurs currently; the Chair of Members Council has an oversight function of this related budget).
   5. Some issues to consider:
      a. Many regions assess regional dues to their chapters which are sometimes but not always used to cover similar expenses by regional officers participating in activities and events such as CRC's.
      b. The policies of all regions related to this matter are not necessarily standardized across all regions and not all DRC's, DRC Nominee's and Host DAL's are reimbursed above and beyond the current transportation reimbursement per the current policy.
      c. Some regions reimburse the current DRC for expenses incurred while attending the CRC in their region beyond the transportation expenses (reimbursed by ASHRAE). In some instances this may be handled through the CRC Host Committee (where they have these expenses waived and which are accounted for in the overall CRC registration fees or where complimentary hotel rooms might be made available to the DRC).
      d. Possibly the individual in question who raised this issue was not aware of regional options to help address offsetting expenses beyond transportation costs or that region may not have a policy in place to address this matter.
   6. Current policy allows each DRC Nominee to attend one CRC outside their region and each DRC to attend one CRC outside their region per year in their first two years as DRC. This results in the potential to attend up to three CRC's outside their region, which some believe may be one too many.
   7. Of the potential number of trips that could be taken under this policy each year, not all slots are

necessarily used and prior budgets have been based on the average use of this option.

8. There is also no limitation to a DRC making two (2) trips to CRC's outside their region in one year as long as they have not used their allocation of two in their first two years.
9. If the policy is revised to include Travel there is a possibility that more of these optional visits will be taken, which is not a bad thing. However, this may also promote more of these visits to CRC's that are geographically further away from their region, to include attending international CRC's, which ultimately may increase the fiscal impact.
10. Finance Committee believed that the current policy needed to be revised and clarified to include adding a limitation to the total number of visits by a DRC Nominee and DRC (in their first two years): Limit the total number of CRC visits outside their region to a total of two (2) and to no more than one per year. This was added as a footnote in the proposed revision. (Motion passed 7-0-0 CNV)

Fiscal Impact: $22,500 (Included in the current version of the 2017-2018 budget).

Information Items:

1. The General Reserve Fund as of May 31, 2017 had total assets of $13,369,000. The General Reserve Fund represents 59% of the average of the General Fund total expenses for the last three years (2013-2014 through 2015-2016). The ROB targets a General Reserve Fund balance that is between 1/3 and 2/3 of a typical annual General Fund total expense. The Research Reserve Fund as of May 31, 2017 had total assets of $5,771,000. There is no ROB target range established for the Research Reserve Fund. Fiscal YTD, both Funds are up ten percent (10%) in value.

2. Finance Committee approved minor changes to the Finance Committee Manual of Operations (MOP) as per the attached MOP.

   Background: The MOP is reviewed annually and these are the changes recommended by the Planning Subcommittee. (Motion passed 7-0-0, CNV)

   Fiscal Impact: None.

3. All of the 2017/18 MBOs are complete except for the following:
   #1 – Finance/Budget Presentation to BOD – Improvements to make more concise and easier to understand.
   #3 – Modernize Volunteer Reimbursement Process
   #4 – Reimbursement Policies for members outside of the U.S.
   These items will be carried over as action items for the 17-18 fiscal year.

4. Finance Committee received a referral motion (Region X (San Diego Chapter) – Motion 4h (10/14/2016) from Members Council that would allow members to have their membership automatically renew when their membership is set to expire. Finance Committee was very pleased to see a focus on improving the efficiency for our members regarding renewing dues. However, this motion was defeated because of the potential added costs and risks of housing payment information electronically for members is too great. A summary of concerns and potential negative impacts include the following:
   a. Required follow up to bad card numbers – expired, cancelled – this is already a large problem with members outside the U.S./Canada
   b. Advertising – Steve Comstock stated annual verification of data (type of firm, title, etc.) is needed to count a subscriber as paid. How would we continue to obtain this information?
   c. "Significant" staff time to set up and maintain – is this effort worth it? (i.e. is there going to be a strong demand for this?)
   d. Current retention rate is approximately 90%. How many more percentage points do we realistically think we can increase this by auto renewal?
   e. Risk of a hacker stealing sensitive information rises significantly
   f. Additional Cyber Liability Insurance will be required due to this additional exposure - $8 - $16K additional cost.

g. Will need to most likely contract with a third party to handle following up with members regarding expired or invalid credit card numbers (as opposed to ongoing staff time) due to full workloads on staff. We would need to add dollars to the budget to cover this expense.

5. Life Members – Finance Committee was tasked with investigating life member benefits and costs and to make a recommendation regarding the Life Member grade of membership. The recommendation is to make no changes. A summary of reasons for this are as follows:
   a. Benefits produced by Life Members compared to the burden in service requests from Society are considerably higher. Several data points and research on this led to this determination.
   b. Life Members are an incredible opportunity for mentorship and knowledge transfer to the next generation of ASHRAE members.

   Finance Committee recommends an information item be sent to the incoming Chair of Member's Council to evaluate the purpose, need and details of a Retiree Member Grade as many current members are unaware of this membership grade.

6. New Region Costs – Finance Committee developed a comprehensive tool that can be used to calculate the potential cost of future Regional structure changes. The tool is an Excel based document that calculates the travel costs associated with regional travel supported by Society and Society travel. The tool does not take into consideration any Chapter level costs.

June 23, 2017
Date

Chair

Financial Update

Board of Directors

Annual Meeting

June 25, 2017

Outline

Financial Status

- Financial Position as of May 31, 2017
- General Fund
  - Current Year and Historical Trends
  - Tracked Programs
- Research Fund Status
- Investment Reserves

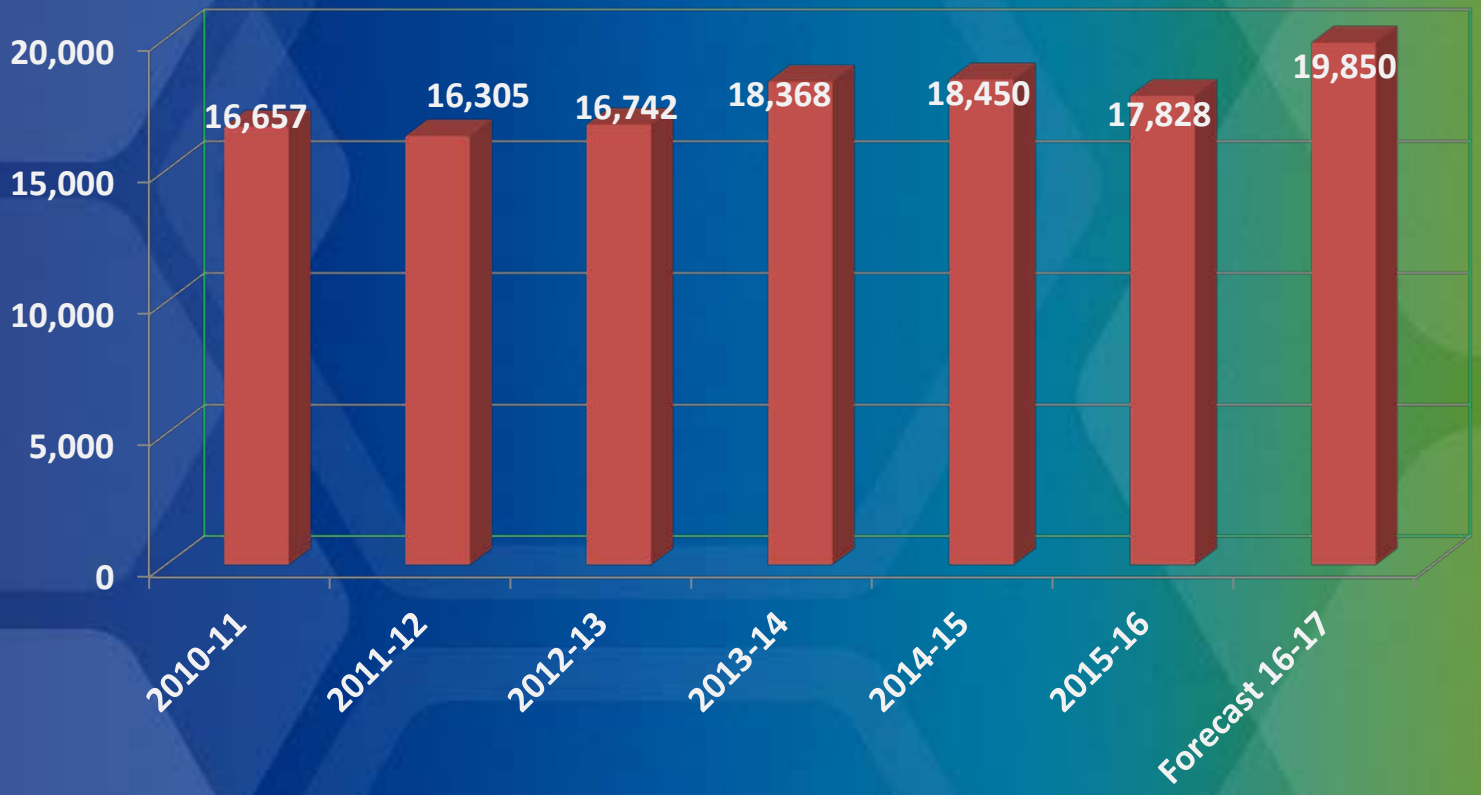
Finance Committee

- Draft Budget for 2017-2018
- Motions for Board approval
  - General Fund
  - Research Fund
  - Capital Budget
- Other highlights

Financial Status

Consolidated Cumulative Net Assets

(Year ending June)



General Fund

16-17 Budget to 16-17 Forecast as of May 31

	16-17 Budget	16-17 Forecast
Revenues	$25,268	$24,386
Expenses	25,551	24,319
Surplus/(Deficit)	$ (283)	$ 67

Major Variations (Forecast vs. Budget)
Year End June 30, 2017

Revenues

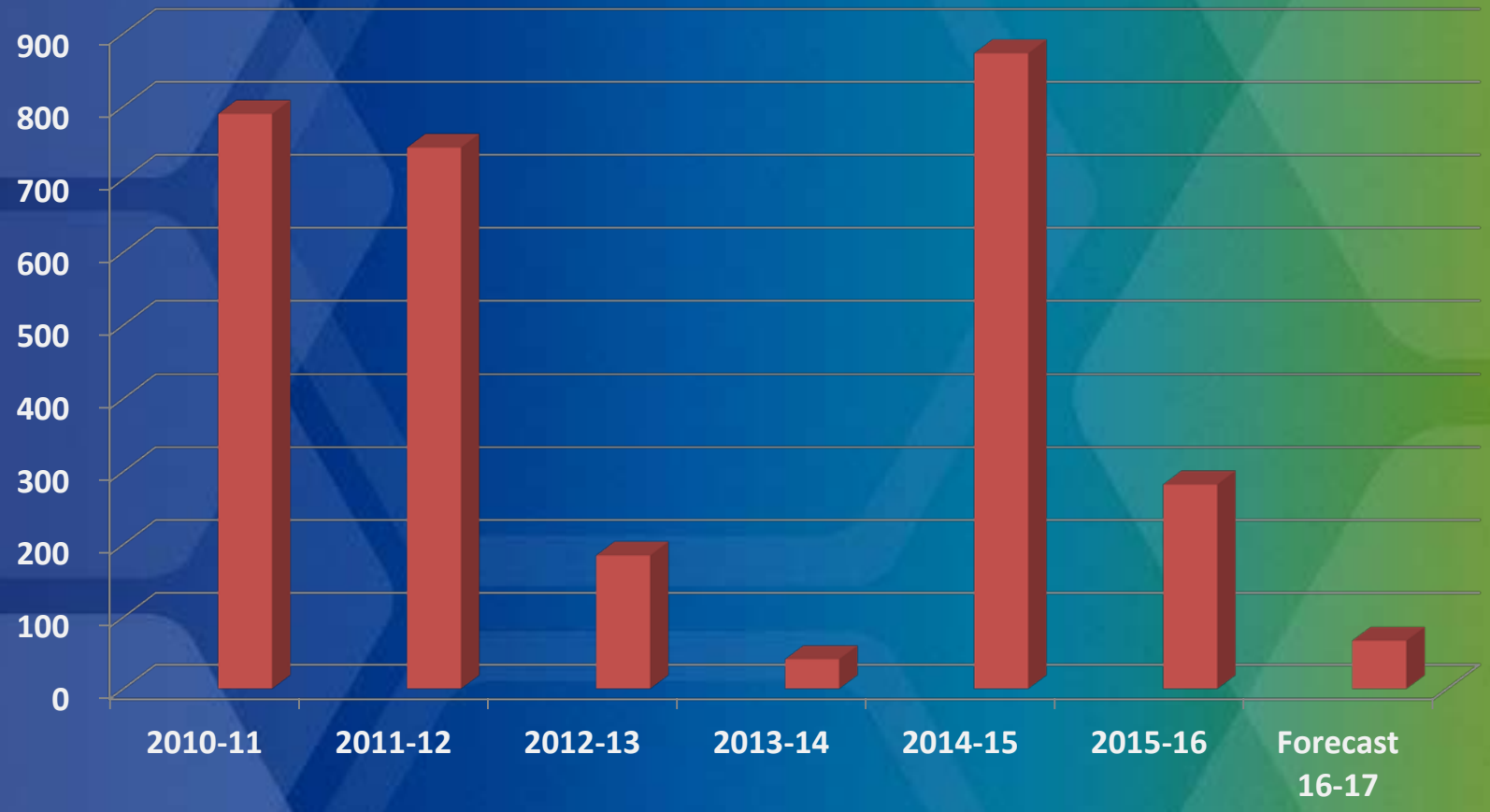
- AHR Expo $456K
  - Significantly stronger vendor demand than originally budgeted in Las Vegas – largest Expo in history
- Education $(450K)
  - eLearning portal was offline was 3 months and encountered some disruption during the year
- Publications $(396K)
  - Income down across all categories of print and non-print publications. Pub/Ed looking at promotional opportunities
- Meeting/Seminar Income $238K
  - Primarily related to record breaking attendance at Winter Meeting

Major Variations (Forecast vs. Budget)
Year End June 30, 2017

Expenses

- Publishing $(339K)
  - Reduced product sales translates into lower related expenses (printing, COGS, shipping, commissions, etc.)
- Outside Services $(358K)
  - Global Training Center – Services agreement signed in April; Staff hired in May ($200K Budget)
- Travel $(198K)
  - Strategic Plan Initiatives 1 & 2 in 16-17 budget ($120K) were not utilized.

General Fund Surplus (Deficit) Before Nonrecurring Expenses, Investment Income/Loss and Reserve Transfers as of May 31 (Exclusive of Foundation)

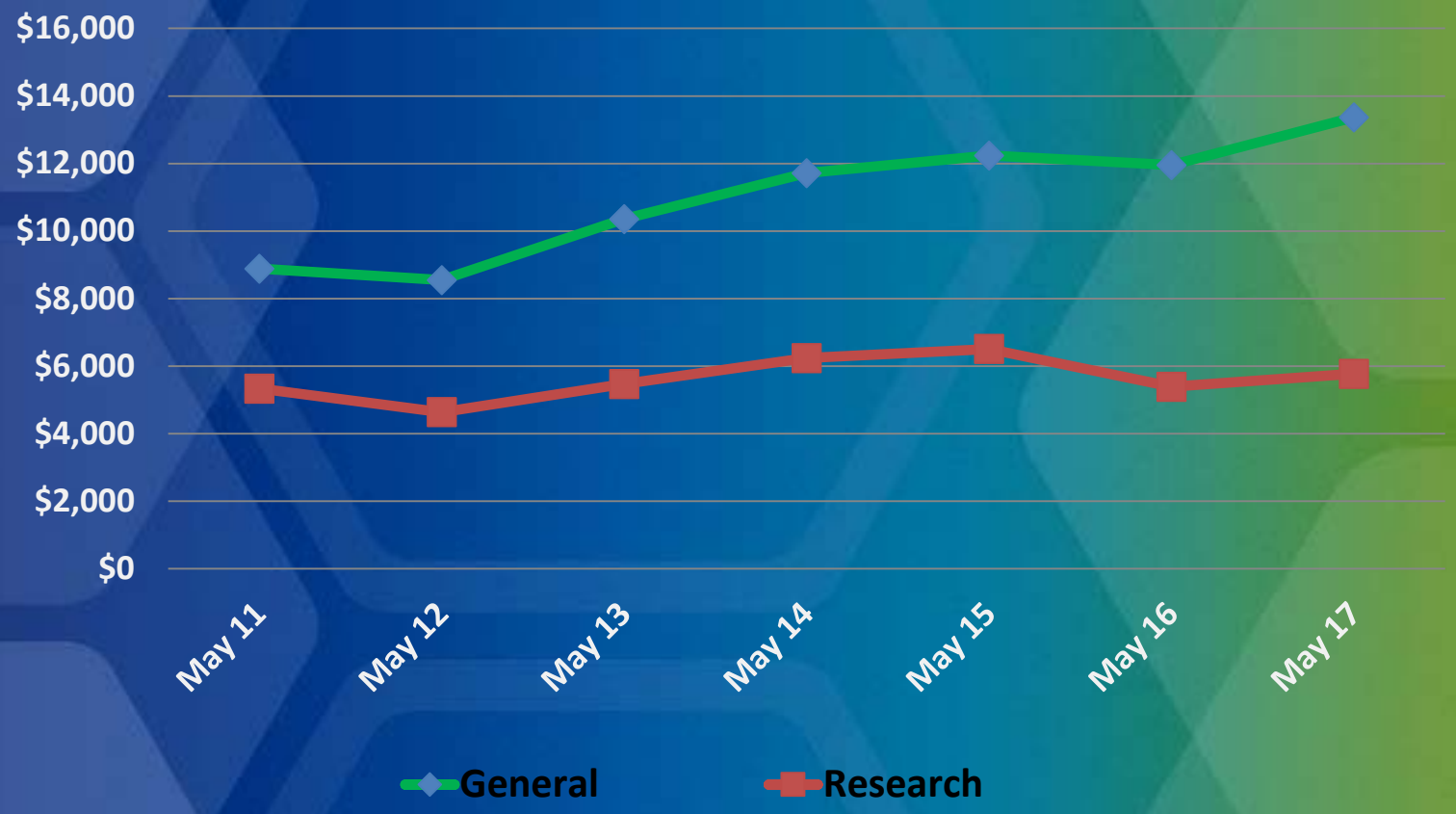


Research Fund

16-17 Budget to 16-17 Forecast as of May 31

	16-17 Budget	16-17 Forecast
Revenues	$5,863	$5,048
Expenses	5,863	5,048
Surplus/(Deficit)	$ 0	$ 0

Investment Reserves
(YTD through May - (exclusive of Foundation))



Finance Committee Report

General Fund
16-17 Forecast and 3-Year Draft Budgets

	16-17 Fcst	17-18 Budget	18-19 Budget	19-20 Budget
Revenues	$24,386	$25,258	$24,981	$25,767
Expenses	24,319	25,559	25,206	26,076
Surplus/(Deficit)	$ 67	$ (301)	$ (225)	$ (309)

General Fund
Three Year Performance

(in thousands)	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	
Three Years Starting (Fiscal)	Actual	Actual	Forecast	Budget	Budget	Budget	Combined
2014-2015	872.8	282.2	67.1				1,222.1
2015-2016		282.2	67.1	(301.4)			47.9
2016-2017			67.1	(301.4)	(224.9)		(459.2)
2017-2018				(301.4)	(224.9)	(309.0)	(835.3)
						Six Year Total	386.8

17-18 General Fund Budget Impact Items

- Dues
  - Annual Increase (Full/Associate/Fellow) – 0.7% (2015 CPI)
- Education Registration - Strong demand for training courses & eLearning
- AHR Expo
  - Chicago – Early numbers show potential to be the largest Expo in history
  - Mexico – No Expo in ‘17-18
- DRC/DAL Travel to other CRC - $22.5K
- GGAC – “Day on the Hill” Travel - $20K
- Globalization Initiative - $200K
- Legal Fees (nonrecurring – below the line) – Fees for case in appeal (conservative estimate) - $210K

17-18 General Fund Budget Impact Items

- 16-17 Society Initiatives
  - Chapter Opportunity Fund - $140K
  - HVAC Certificate & Tools Developed for Consulting Engineering Essentials - $50K
  - Chapter Leadership Academy - $50K
  - Adapt bEQ – Student branches - $25K
  - Application Guides for Practicing Professionals - $30K
  - Smartphone Apps – ASHRAE Technology - $30K
  - Technology Portal - $5K
- Total of $330K included in ‘17-18 Budget

17-18 General Fund Budget Impact Items

- 17-18 Society Initiatives
  - Increased (outside of NA) Solar Decathlon support - $50K
  - New European Region - $50K
  - Meeting outside North America with an ASHRAE/UNEP conference - $40K
  - Global Student Branch Competition - Dev. Econ. - $30K
  - New European Region “CRC” - $30K
  - Develop Design Guide & IEQ Guide for Dev. Econ. - $25K
  - Develop Design Guide for Residential - $15K
  - Topical Conference on Residential/Dev. Econ. - $30K
  - AASA Ad-hoc - $10K
  - Marketing global outreach - $10K
  - Presidential outreach to Cuba - $4K

- Total of $294K included in ’17-18 Budget

17-18 General Fund Budget Impact Items

- Strategic Plan - $160K
  - Initiative 1 – Market Prioritization
    - Employer Support/REACH - $35K
    - Technology Impact - $75K (Carryover Item from ‘15-16)
  - Initiative 2 – Organizational Assessment
    - Alignment with other Organizations - $25K
  - Initiative 3 – Applied Product Development
    - Electronic Tools - $15K
  - Initiative 5 – Residential Sector
    - Partnerships & Collaboration - $10K

17-18 General Fund Budget Impact Items

- Items NOT Included in 17-18 Budget
- Carryover items
  - Strategic Plan – ’16-17 items that were not utilized
  - Forecasted remaining 16-17 Globalization Initiative funds – Global Training Center

Research Fund
16-17 Forecast to 17-18 Budget

	16-17 Forecast	17-18 Budget
Revenues	$5,048	$5,609
Expenses	5,048	5,609
Surplus/(Deficit)	$ 0	$ 0

Research Fund Budgeting

- Membership Dues – 2% of membership dues shall be distributed to the Research Fund
- Contributions & Matching Gifts - A portion of the Expo Income (equal to the dollars raised by Research Promotion), shall go into the Research Fund (Minimum of $1.5M, Max of $2.0M)
- Minimum of 4% of Research Reserve Fund is budgeted as income (transferred to Research Fund) each year
- Annual Expenses shall not exceed Income

Capital Expenditures

- Annual Budget Request - $200K
  - Historically includes ASHRAE HQ Expenditures for assets (office equipment, computers, etc.)
  - ASHRAE Website Overhaul - $100K remaining estimate to complete and launch in 17-18 fiscal year
- NetForum Update/Upgrade - $150K
  - Will add significant enhancements and new technology
  - Current version is 2011
- This would increase the total annual budget request to $350K for FY17-18

- Projects started in FY16-17 that will continue into FY17-18
  - Building EQ – Web Portal
    - $200K approved in FY16-17
    - $90K remaining - anticipate launch in September/October
  - Online Comment Database rebuild
    - Tech Council has $200K approved in FY16-17
    - $150K remaining – anticipate launch in November
  - ASHRAE Website Overhaul
    - Approved as part of FY16-17 $200K annual budget request
    - $100K remaining – anticipate launch in FY17-18

REPORT TO THE EXECUTIVE COMMITTEE
From ASHRAE Representative for the AEDG Steering Committee
As of June 24, 2017

Recommendations for ExCom Approval:

1. None.

Information Items:

1. AEDG Distribution Recap as of June 1, 2017:

   - 588,034 AEDGs downloaded as of June 1, 2017
   - 26,274 titles distributed in print
   - **614,308 total copies in circulation as of June 1, 2017**
   - 152,541 registrants account for free AEDG downloads

   - 64,491 copies of 50% AEDG-SMO since May, 2011
   - 30,108 copies of 50% AEDG-K12 since October, 2011
   - 45,863 copies of 50% AEDG-Retail since January 2012
   - 20,831 copies of 50% AEDG-Hospital since May 2012
   - 6,273 copies of 50% AEDG-Grocery since March 2015

2. The development of the *Advanced Energy Design Guide for K-12 Buildings: Achieving a Zero Energy Building* is nearing completion. Peer Reviews were conducted in February 2017 and May 2017. The project is on schedule for publication in October-November, 2017.

3. A seminar on the K-12 ZEB guide was presented at the AIA annual convention in Orlando on April 27-29. A presentation has also been accepted for Greenbuild in November 2017.

4. Individual downloads of the 50% AEDG Recommendation Tables have been added to the AEDG free download web pages. How to market the existence of these pages is being discussed by the AEDG Steering Committee at the Long Beach Annual meeting.

5. A survey was sent out in May 2017 to all past downloaders of an AEDG. Over 2800 responses were received including 800 responders who agreed to be contacted for follow-up questions if needed. The survey explored how the downloaders were using the guides, what they liked about the guides, and what would motivate them to increase usage of the guides. The AEDG Steering Committee will be reviewing the survey results at the Long Beach Annual meeting.

6/13/17
Date

Pat Graef
Pat Graef, ASHRAE Representative

Memorandum of Understanding
Indoor Environment Quality Global Alliance (IEQ-GA)

The undersigned organizations agree by this Memorandum of Understanding to ~~the formation of the~~ continue their participation in the "Indoor Environmental Quality-Global Alliance, IEQ-GA" to be the global source for information, guidance and knowledge on environmental quality in indoor environments.

INDOOR ENVIRONMENTAL QUALITY GLOBAL ALLIANCE

IEQ-GA will provide guidance on the definition of acceptable indoor environmental quality, with an emphasis on thermal conditions and indoor air pollution, to ensure that the knowledge gathered from Indoor Environmental Quality (IEQ) research is promulgated to, and implemented by, IEQ practitioners and regulatory bodies worldwide.

The organizations will work together to create a common understanding and messaging of research gaps, what results of research can be transferred to practice in the form of standards and codes that support a health and performance based definition of IEQ, and a legislative agenda and advocacy position.

The organizations agree:

- To set up procedures for operation of the IEQ-GA
- To establish a web-page for distribution of information and contacts
- To become a broad resource on IEQ issues
- To meet (preferably in person or optional virtual) at least two times per year during the first two years of the Alliance's existence to follow up on agreed actions and planning future actions.

Besides the founding organizations the alliance will seek cooperation with other organizations (e.g. WHO, EPA etc.) The Alliance will also seek new members or collaborations with other organizations that work directly with the impact of the indoor environment on people's well-being and health.

The signatories to this MOU will explore the following potential activities and goals:

ADVOCACY

Where mutually beneficial and to the extent allowed by laws and corporate policies, the organizations will work together on common public affairs goals and initiatives. During the semi-annual meetings of IEQ-GA, public affairs strategies will be discussed and common goals identified. Collaborative opportunities to be considered include:

- Advocating IEQ issues (or creating an advocacy agenda and arguments.
- Promoting awareness of the importance of IEQ among regulatory and legislative bodies.
- Joint promotion of codes and standards at the local, state, national and international levels.
- Promoting mutually beneficial positions during the development and passage of state, national and international legislation.
- Education of legislators on issues important to indoor environmental quality.

PUBLICATIONS

Recognizing that electronic and print publications are a primary means of disseminating new technologies, trends and practices, the member organizations will, where appropriate:

- Explore opportunities to jointly produce and publish publications of mutual benefit.
- Cross-market each organization's publications.
- Under the IEQ-GA umbrella, use periodicals to promote the other organization's events, publications and other activities.

EDUCATION

As leading providers of conventional and online educational services and in recognition of the vital role professional development has for our respective members, the organizations will:

- Cross-market educational offerings at the regional, national and international levels.
- Under the IEQ-GA umbrella explore opportunities to co-develop new courses or other training programs that take advantage of shared and complimentary expertise among the organizations.

TECHNICAL ACTIVITIES COORDINATION

The organizations will foster technical cooperation in areas of common interest as appropriate by:

- Encouraging members in each organization to participate on technical committees and task forces of other organizations.

- Providing opportunities to participate in and comment on proposed standards, guidelines, policies, and position statements developed on technical subjects related to indoor environmental quality,
- Establishing liaison representatives to key technical committees where mutually beneficial to do so.
- Under the IEQ-GA umbrella, developing common technical activities that may result in common guidelines, policies and position statements.

RESEARCH

Recognizing the importance research plays in accelerating the transformation to better indoor environments, the organizations will work to:

- Promote research in areas that will add to the body of knowledge in indoor environmental quality.
- Disseminate research results quickly, focusing on high-impact findings.
- Identify opportunities for research funding from other sources.

CONFERENCES AND MEETINGS

Recognizing that each organization may address different aspects and areas of IEQ subject matter expertise, the organizations will foster the exchange of expertise, where appropriate, by:

- Publicizing each member's meetings and promote attendance.
- Promoting access to speakers at the other organization's meetings to help provide information and perspectives on technologies and trends related to indoor environmental quality. Agreement as to who pays these costs should be done on a case by case basis between organizations or between a speaker and the meeting organizer.
- Actively look for more synergies in the setting up of conferences.

LOCAL COLLABORATION

Recognizing that each society has members and activities that are geographically local or regional in nature and that collaboration at the local and regional level can benefit all, the organizations will work to:

- Promote joint grassroots meetings of their respective members, such as exchange of grassroots leader contact information.

FOUNDING MEMBERS

As the founding organizations begin to explore the opportunities for collaboration, any projects or activities for which there may be the need for additional resources may require a specific agreement. The founding organizations are:

- AIHA- American Industrial Hygiene Association
- AIVC-Air Infiltration and Ventilation Centre
- ASHRAE- American Society of Heating, Refrigerating and Air-Conditioning Engineers
- AWMA- Air and Waste Management Association
- IAQA- Indoor Air Quality Association
- REHVA- Federation of European Heating, Ventilation and Air Conditioning Associations

ADMINISTRATIVE CONTACTS

The administrative contacts for actions tied to this MOU shall be:

FOR AIHA:
Russ Hayward
Managing Director, STI
AIHA
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Falls Church VA 22042 USA
Tel: 703-846-0786
Email: rhayward@aiha.org

FOR AIVC:
Stephane Degauquier
General Secretary
AIVC
Lozenberg 7
BE 1932 Sint-Stevens-Wol uwe Belgium
Tel: +32-2-655-77-70
Email: stephane .degauquier@bbri.be

FOR ASHRAE:
Jeff Littleton
Executive Vice President
ASHRAE
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Email: jlittleton@ashrae.org

FOR AWMA
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Director
A&WMA
420 Fort Duquesne Blvd.
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Pittsburgh, PA 15222
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Email: sglyptis@awma .org

For IAQA:
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Executive Vice President
IAQA
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Atlanta, GA 30320
Tel: 844-802-4103
Email: ssears@iaqa.org

FOR REHVA:
Anita Derjanecz
Managing Director
REHVA
Rue Washington 40
1050 Brussels, Belgium
Tel.: +32-2-5141171
Email: ad@rehva.eu

TERMINATION

Any party may terminate this MOU and participation in the alliance, with or without stated cause, upon providing the other parties with 3 months written notice of intent to terminate.

TERM

The term of this Memorandum of Understanding shall begin when signed and shall ~~terminate at the end of two (2) years unless extended at that time by written agreement~~ be reviewed every two (2) years by all Founding Members to ensure this MOU is current, as appropriate.~~.~~

LEGAL STANDING

This MOU reflects a commitment by the organizations to continue and enhance their working relationship and individual efforts toward achieving mutual objectives described above. It does not create a binding obligation or agreement between the organizations, and none of the organizations have an obligation to negotiate toward or enter into a binding written agreement. In addition, this MOU does not create a partnership, joint venture, fiduciary relationship or similar relationship between the

organizations. Furthermore, it is understood that this Memorandum of Understanding is conceived as a dynamic document, meant to change as circumstances and priorities warrant. It may be modified or amended by written agreement between all organizations.

FOR AIHA

Steven Lacey/President
Printed Name/Title

_____
Signature

_____

Date

FOR AIVC

Peter Wouters/ Operating Agent
Printed Name/Title

_____
Signature

_____

Date

FOR ASHRAE

Tim Wentz / President
Printed Name/Title

_____
Signature

_____
Date

FOR AWMA

Scott Freeburn / President
Printed Name/Title

_____
Signature

_____
Date

FOR IAQA

John Lapotaire / President
Printed Name/Title

/_____
Signature

_____
Date

FOR REHVA

Stefano Corgnati / President
Printed Name/Title

_____
Signature

_____
Date

Shaping Tomorrow's Built Environment Today

BUILDING ENERGY DATA: A CRITICAL RESOURCE

THE ISSUE

Reducing the energy use of buildings requires the availability of a robust database of building energy data to define the baseline against which progress can be measured. Because buildings account for approximately 40% of US energy use[1] and about 74% of US electricity consumption[2], they can be a significant resource for reducing energy use. However, limited data exist to actually understand the energy use associated with individual buildings and the factors that affect energy use. Despite increased focus on improving the ability for all new buildings to use energy more efficiently, existing buildings represent the greatest source of energy use within the sector, and of course when initially occupied, new buildings become existing buildings.

Improved understanding of existing building energy use characteristics will clarify the relationship between intended and actual performance. Understanding these gaps can result in better building design, inform operations and maintenance practices, and provide input to energy codes and standards that establish design and construction criteria for new buildings, and renovations and additions to existing buildings.

ASHRAE's ROLE

As a technical society whose priorities include reducing the energy use of buildings, ASHRAE has the resources and expertise to guide the development of more energy efficient buildings. ASHRAE disseminates best practices to professionals across the building sector by developing standards, guidance, and educational resources. However, those best practices must be informed by robust data on the actual energy performance of buildings. To help building owners and operators understand the energy use of their buildings and opportunities for improvement, ASHRAE has developed a building energy rating program and performance tool (the Building Energy Quotient[3]) that requires valid data across building types and climate zones. ASHRAE has also updated its Standard 105, and is developing standards for measuring and expressing building energy performance in a rating program (Standard 214P), as well as a standard that establishes consistent practices for conducting and reporting commercial building energy audits (Standard 211P).

ASHRAE's VIEW

Existing Federal and State programs, like the US Energy Information Administration's Commercial Buildings Energy Consumption Survey (CBECS), serve as the baseline for many initiatives designed to reduce energy consumption in both new and existing buildings. The importance of this data will continue to grow as the nation and the building community focus on reducing energy use.

Recommendations for maintaining and enhancing the availability of building energy data:

- Adequately fund the US Energy Information Agency to allow for the timely release of robust datasets focused on the energy use of buildings and increase their coverage. Also support the agencies and programs that make use of this data, including EPA's ENERGY STAR program and those administered by the US Department of Energy's Building Technologies Office.
- Support the development and implementation of technically sound private sector programs designed to reduce building energy use and report on the actual energy use of buildings, such as ASHRAE's Building Energy Quotient program.
- Support the adoption, application, and use of ASHRAE Standard 105 to provide a uniform and robust method for measuring and expressing building energy performance.

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[1] US Department of Energy. 2011. "2011 Buildings Energy Data Book". http://buildingsdatabook.eren.doe.gov/TableView.aspx?table=1.1.3.

[2] US Department of Energy. 2011. "Buildings Share of U.S. Electricity Consumption (Percent)". http://buildingsdatabook.eren.doe.gov/TableView.aspx?table=1.1.9

[3] www.buildingeq.com

Shaping Tomorrow's Built Environment Today

CLIMATE CHANGE AND BUILDING ENERGY EFFICIENCY

THE ISSUE

Improving building energy efficiency reduces greenhouse gas (GHG) emissions. GHGs contribute to rising global temperatures. Heating, ventilating, air conditioning, and refrigeration (HVAC&R) systems directly contribute to GHG emissions through CO_2 emissions associated with the energy needed to operate buildings and building systems (which account for approximately 40% of America's total energy consumption[1]), and to a lesser extent indirectly through the release of refrigerants, if not properly contained. Therefore, by implementing building energy efficiency, climate change can be forestalled, as indicated by the International Panel on Climate Change (IPCC), which found that the global building sector has the greatest potential for economical GHG mitigation between now and 2030[2].

ASHRAE's ROLE

ASHRAE and its members help policymakers promote the implementation of energy efficient design practices and sustainable technologies, most notably through ASHRAE Standard 189.1, that addresses sustainability in buildings and building sites. In addition, ASHRAE's Building Energy Labeling Program, called Building Energy Quotient (bEQ), has been developed to help building owners manage their energy use via in depth performance analyses. Our expertise on GHG emissions reductions can help policymakers address climate change.

ASHRAE's VIEW

ASHRAE encourages policymakers to implement integrated approaches including:

- Funding for research that improves energy efficiency/utilization in HVAC&R technology to minimize energy-use CO_2 emissions.
- Funding for building science research leading to advanced equipment and systems, and increased understanding of how building design affects long-term operations and responds to climate change.
- Full evaluation of building climate impacts and energy performance.
- Policies that address both existing and new buildings.
- Consideration of all environmental impacts attributable to buildings.
- Opportunities to make buildings more energy efficient.
- Policies encouraging building owners and operators to optimize energy efficiency.
- Promotion of life-cycle-cost analysis to building owners to encourage sustainable building construction, operation, and renewal.
- Strategies that consider all phases of a building's life, including design, construction, commissioning, and operation; recognizing that operational energy use is a dominant factor in total impact.

ASHRAE Resource Documents *(see www.ashrae.org)*
ASHRAE Position Document on Climate Change
International Green Construction Code and ANSI/ASHRAE/USGBC/IES 189.1-2014 *Standard for the Design of High-Performance, Green Buildings Except Low-Rise Residential Buildings*
ANSI/ASHRAE/IES 90.1-2013 *Energy Standard for Buildings Except Low-Rise Residential Buildings*
ANSI/ASHRAE Standard 90.2-2007 90.2 *Energy Efficient Design of Low-Rise Residential Buildings*
ANSI/ASHRAE Standard 105-2014 *Standard Methods of Determining, Expressing and Comparing Building Energy Performance and Greenhouse Gas Emissions*
ANSI/ASHRAE Standard 62.1-2016 *Ventilation for Acceptable Indoor Air Quality*
ANSI/ASHRAE Standard 62.2-2016 *Ventilation and Acceptable Indoor Air Quality in Low-Rise Residential Buildings*
ANSI/ASHRAE Standard 34-2013 *Designation and Safety Classification of Refrigerants*
ANSI/ASHRAE Standard 15-2013 *Safety Standard for Refrigeration Systems*
ASHRAE, AIA, USGBC, IES Advanced Energy Design Guides for Buildings
ASHRAE Energy Efficiency Guide for Existing Commercial Buildings: The Business Case for Building Owners and Managers
ASHRAE Energy Efficiency Guide for Existing Commercial Buildings: Technical Implementation

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[1] US Department of Energy. 2011. "2011 Buildings Energy Data Book". http://buildingsdatabook.eren.doe.gov/TableView.aspx?table=1.1.3.

[2] IPCC. 2007b. Mitigation of Climate Change. Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change. Geneva: International Governmental Panel on Climate Change.

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Shaping Tomorrow's Built Environment Today

COMMERCIAL BUILDING ENERGY USE DISCLOSURE

THE ISSUE

Commercial buildings (i.e., offices, schools, stores, similar nonresidential facilities – whether publicly or privately owned) account for 46% of US energy consumption within the buildings sector[1]. As the saying goes "You can't manage what you don't measure". In the buildings sector context, this means that the potential savings of the built environment won't be unlocked without the public display and disclosure of building energy use and their related energy efficiency attributes.

ASHRAE's ROLE

- ASHRAE helps policymakers understand the technical and implementation barriers that can prevent the market from obtaining cost-effective energy efficiency.
- ASHRAE is committed to developing and promoting building energy rating programs and other technical tools to assist the commercial building industry to design, construct and operate the most energy efficient buildings feasible.
- ASHRAE disseminates credible evidence-based practices and technical information to professionals across the building sector by developing standards, guidance, and educational resources informed by robust data on the actual energy performance of buildings.

ASHRAE's VIEW

Public display and disclosure of the energy efficiency attributes of a building and its energy use intensity (EUI) will lead the market (i.e., building owners, lenders, tenants) to consider cost-effective energy efficiency improvements at the time of design and construction, during maintenance and operation, and in any subsequent renovations.

In general, energy efficient buildings should command more value in the real estate market, while buildings documented as having high energy use/operating costs should be perceived as having less value in the real estate market.

Policymakers should support development, adoption, and implementation of technically sound, cost-effective, public and private sector programs and standards aimed at reducing building energy use. To further these aims, policymakers can look to ASHRAE, which has the resources and expertise to guide the development of a more energy efficient built environment.

- ASHRAE's Building Energy Quotient (bEQ) rating program requires valid data across building types and climate zones; contains both As Designed (Asset) and In Operation (Operational) rating protocols; and builds in a high level of quality assurance through a Level 1 Energy Audit and by requiring building assessments to be performed by qualified professionals.[2]
- ASHRAE is developing Standard 214P which will provide a standardized approach and methodology for measuring and expressing building energy performance in a rating program.
- ASHRAE has updated Standard 105, which addresses measuring and expressing building energy performance[3]; and is developing is developing standards for measuring and expressing building energy performance in a rating program (Standard 214P), as well as a standard that establishes consistent practices for conducting and reporting commercial building energy audits (Standard 211P).[4]
- ASHRAE has published *Procedures for Commercial Building Energy Audits* and *Performance Measurement Protocols: Best Practices* to guide owners and operators in their decision-making.
- ASHRAE continues to update its high performance and energy efficiency related standards, such as 189.1, 100, 90.1, 62.1, 55, and 180.

[1] US Department of Energy. 2011. "2011 Buildings Energy Data Book". http://buildingsdatabook.eren.doe.gov/TableView.aspx?table=1.1.3.
[2] For more information, see http://buildingenergyquotient.org/.
[3] For more information, see https://www.ashrae.org/standards-research--technology/standards--guidelines/titles-purposes-and-scopes#105.
[4] For more information see https://www.ashrae.org/standards-research--technology/standards--guidelines/titles-purposes-and-scopes#SPC211P.

Shaping Tomorrow's Built Environment Today

CONSENSUS STANDARDS: EXPERT SOLUTIONS TO MEET GLOBAL NEEDS

THE ISSUE

Consensus standards developed in the voluntary sector are essential for a sound global economy and to facilitate global commerce. Standards foster building technology innovation by providing a transparent baseline and needed metrics for assessing how that technology can impact building design and performance. They are necessary for comparing technologies in the expanding global marketplace. US Federal policy recognizes the value of voluntary consensus standards by requiring their use in regulations when consistent with agency policy and appropriate for agency purposes[1].

Voluntary consensus standards are developed through the participation of any and all interested and affected stakeholders including manufacturers, users, and representatives of government and academia. Standards accreditors such as the American National Standards Institute (ANSI)[2], the International Organization for Standardization (ISO), and the International Electrotechnical Commission (IEC) follow several principles such as including consensus, openness, balance, transparency, and due process, and sure that designated standards development organizations follow these principles and processes.

ASHRAE's ROLE

ASHRAE develops and publishes robust standards; many of which are adopted into building codes. ASHRAE standards establish recommended practice in the areas of indoor air quality, energy conservation and management, high-performance green buildings, and others. ASHRAE is one of only six standards-developing organizations in the US that can self-certify that its standards have followed ANSI's procedures. ASHRAE also serves on US Technical Advisory Groups (TAGS) for ISO Committees and in the role of international secretariat for ISO Technical Committees to help ensure that ASHRAE views are represented. These standards are supported by technical committees that develop publications and educational materials to assist in the application of ASHRAE standards.

ASHRAE's VIEW

Since voluntary consensus standards are used widely at all levels of government, it is important that the needs of government are addressed in ASHRAE standards. If not, the standards cannot be adopted and used, or must undergo time-consuming and costly revision.

Recommendations for government participation in the development and use of consensus standards for the built environment:

- Legislative and Executive Branch entities should support voluntary consensus standards in laws and regulations.
- Agencies should work with standards developers and industry to identify situations where societal interests could be addressed through the use of voluntary consensus standards and work together for common solutions.
- Governments should continue to foster and support the unique character and strengths of the public-private partnership in standards development as they pursue trade and other international agreements, regulatory harmonization, and legislative and regulatory approaches.
- Governments should support policies, both domestically and internationally, which ensure the continued ownership and control of the copyrights and trademarks of standards developers, or develop other mechanisms to cover the costs and value of these standards.
- Government agencies should increase participation in the development of voluntary consensus standards, by encouraging government experts to participate, through release time and expenses incurred.

[1] The National Technology Transfer and Advancement Act of 1995 (P.L. 104-113) (NTTAA) and OMB Circular A-119

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Shaping Tomorrow's Built Environment Today

ENERGY EFFICIENCY FOR BUILDINGS AND HVAC&R EQUIPMENT

THE ISSUE

In the United States, residential and commercial buildings account for approximately 40% of the total primary energy use. Specifically, heating, ventilation, air conditioning, and refrigerating (HVAC&R), and water heating are responsible for about 75% of residential[1] and 54% of commercial building site energy use[2]. Cost effective energy efficiency is critical for the economy, the environment and energy security.

ASHRAE members participate in integrated building design, operation and evaluation. They support building sustainability to assure safe, comfortable indoor environments while limiting the impact on the earth's natural resources. ASHRAE collaborates with other leading technical societies and is the leading developer of building energy standards. For example, Federal law mandates ANSI/ASHRAE/IES Standard 90.1 as the basis for State commercial building energy codes. ASHRAE's 2013 version of Standard 90.1 improves minimum energy efficiency by approximately 37.7% from the 2004 edition of Standard 90.1 for regulated loads and almost 50% more efficient than 1999 edition. Other standards and guidance from ASHRAE include Standard 189.1 for the Design of High-Performance Green Buildings Except Low-Rise Residential Buildings, Standard 202 – Commissioning Process for Buildings and Systems, Standard 100 – Energy Conservation in Existing Buildings, and the Advanced Energy Design Guides which provide tools for going beyond minimum requirements. Additionally, ASHRAE promotes the design, construction and operation of highly energy efficient buildings through its professional certifications and by providing and disseminating technical information for the building and policymaking community.

ASHRAE helps policymakers address the technical and implementation barriers that can prevent the market from obtaining cost-effective energy efficiency.

ASHRAE's VIEW

Congress should adopt legislation that improves building energy efficiency through voluntary equipment consensus standards and performance-oriented building codes based on those standards. Code-adopted standards can save more energy than any other policy tools, and consensus standards (e.g., ASHRAE Standard 90.1) help ensure technical and economic feasibility.

Congress should assure that Federal policies related to energy efficiency support innovation, reduce market barriers, include full environmental considerations, and ensure that government leads by the example of outstanding design, construction, and operation of its own buildings, whether owned or leased. Making new technologies and practices mainstream is the key to win-win strategies for the owners, the economy and the environment. The Federal government itself is the nation's largest building owner, so the potential savings from leadership are greatest when government sets the example, and as a result encourages building owners to follow suit.

Congress should appropriate increased funding for research, development, demonstration and deployment to advance energy efficiency and renewable energy technologies and practices. Funding by successive Administrations in Washington, DC has historically been based on technological innovation as a critical tool for ensuring that the nation has affordable, clean, and reliable energy, and helping stimulate innovation in the private sector.

ASHRAE Resource Documents

ANSI/ASHRAE/IES Standard 202 *Commissioning Process for Buildings and Systems*
International Green Construction Code and ANSI/ASHRAE/USGBC/IES 189.1-2014 *Standard for the Design of High-Performance, Green Buildings Except Low-Rise Residential Buildings*
ANSI/ASHRAE/IES 90.1-2013 *Energy Standard for Buildings Except Low-Rise Residential Buildings*
ANSI/ASHRAE Standard 90.2-2007 90.2 *Energy Efficient Design of Low-Rise Residential Buildings*
ANSI/ASHRAE Standard 105-2014 *Standard Methods of Determining, Expressing and Comparing Building Energy Performance and Greenhouse Gas Emissions*
ANSI/ASHRAE Standard 62.1-2016 *Ventilation for Acceptable Indoor Air Quality*
ANSI/ASHRAE Standard 62.2-2016 *Ventilation and Acceptable Indoor Air Quality in Low-Rise Residential Buildings*
ASHRAE, AIA, USGBC, IES Advanced Energy Design Guides for Buildings

[1] US Department of Energy. 2011. "Building Energy Data Book: Chapter 2: Residential Sector". http://buildingsdatabook.eren.doe.gov/ChapterIntro2.aspx?2#1.
[2] US Department of Energy. 2011. "Building Energy Data Book: Commercial Sector Energy Consumption". http://buildingsdatabook.eren.doe.gov/TableView.aspx?table=3.1.4

ASHRAE Government Affairs Office • 1828 L St., N.W., Ste. 810, Washington, DC 20036-5104 USA
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Shaping Tomorrow's Built Environment Today

ENERGY USE METRICS AND TARGETS FOR COMMERCIAL BUILDINGS

THE ISSUE

Commercial buildings[1] consume almost 20% of all energy used in the United States[2]. Energy efficiency helps create jobs, reduce pollution, and improve energy security. A building's utility costs are some of the largest, yet most controllable, operating expenses; therefore, managing a building's energy efficiency is an integral part of the building's operational and financial performance.

You can't manage what you don't measure, and building owners, operators, and policymakers can't effectively communicate goals, evaluate potential investments, and measure success if they don't speak the same language. Common, widely accepted and validated definitions and metrics of building energy use do not currently exist. By working with stakeholder groups and Federal agencies to develop, validate, and establish these common metrics and associated targets, Congress can help solve this communication problem.

ASHRAE's ROLE

ASHRAE and its partners[3], develop building energy standards that Federal agencies, States, and local governments adopt in their energy codes. ANSI/ASHRAE/IES Standard 90.1 has been the basis for State commercial building energy codes since 1975. Standard 90.1 also serves as the US Department of Energy's baseline for measuring relative energy use improvement in Federal buildings. ASHRAE uses data from the Commercial Buildings Energy Consumption Survey (CBECS) in its standards, and in its building energy rating program and performance measurement tool – Building Energy Quotient (bEQ)[4]. ASHRAE is committed to developing and promoting building energy data and other technical tools to assist the commercial building design, construction and operation industry in moving towards the most efficient buildings feasible. To this end, ASHRAE has updated its Standard 100 *Energy Conservation in Existing Buildings*, and its Standard 105 *Standard Methods of Determining, Expressing and Comparing Building Energy Performance and Greenhouse Gas Emissions*. ASHRAE will continue to be a resource to the Federal government by providing technical tools to aide owners and operators in their decision-making, such as *Performance Measurement Protocols: Best Practices*, and by serving as a voice of the industry.

ASHRAE's VIEW

Energy use targets must be based on the best technologies available, to foster innovation. They must include all building loads, from lighting and HVAC to plug-in appliances.

Congress should foster collaboration among DOE, NIST, EPA, ASHRAE and others to 1) Establish a single objective definition of energy use intensity[5] (EUI), including plug and process loads; 2) Identify an objective set of commercial building types and simulation models for establishment of target EUIs; 3) Produce one set of target EUIs for the commercial building sector for use in State building energy codes; 4) Undertake measures that disseminate, educate, and lead all parties in the building industry to use these objective measures to demonstrate the economic and environmental value of their actions.

Congress should support regular updates to the Commercial Buildings Energy Consumption Survey. The recent 2012 update was the first in nine years. Maintaining recent data on energy consumption in the US will make it easier to identify opportunities to increase efficiency and assess progress towards energy efficiency goals. ASHRAE should also encourage international efforts to gather and disseminate data on commercial buildings worldwide.

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[1] "Commercial buildings" are defined as offices, schools, stores, and similar non-residential facilities, whether ownership is private or public.
[2] US Department of Energy. 2011. "2011 Buildings Energy Data Book". http://buildingsdatabook.eren.doe.gov/TableView.aspx?table=1.1.3.
[3] Including the Illuminating Engineering Society of North America, the US Green Building Council, the American Institute of Architects, the International Code Council, and the Air Conditioning Contractors of America.
[4] Additional information on ASHRAE's bEQ is available at www.buildingeq.com.
[5] Energy Use Intensity (EUI) is the most commonly accepted metric to measure a building's absolute energy use performance. It is traditionally measured in kBtu/sf-yr.

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Shaping Tomorrow's Built Environment Today

RESEARCH AND DEVELOPMENT NEEDS TO MEET NATIONAL GOALS

THE ISSUE

Federally funded research and development provides cross-cutting results to meet national goals of economic growth, increased energy efficiency, a globally competitive workforce, and a clean environment. For example, the National Research Council report, *Energy Research at DOE: Was It Worth it?* (2001) found that the economic benefit to the nation of a few advanced technologies whose research and development (R&D) was supported by the Department of Energy's (DOE) energy efficiency programs was over four times greater than DOE's R&D investment in energy efficiency over its entire history. The results of just six case studies showed sufficient savings to justify the entire government R&D spending in energy efficiency. Significant environmental and energy security benefits also were realized. Other Federally supported research programs contribute to meeting other national goals.

ASHRAE's ROLE

ASHRAE funds and supervises a robust research program to develop timely technical and educational information, standards and guides on, among others, the interaction between people and the indoor and outdoor environment through the operation of heating, ventilating, air conditioning, and refrigerating systems in buildings and other applications. ASHRAE supported research has advanced indoor air quality to increase occupant productivity and decrease the spread of airborne diseases; building design that supports a reduction in energy use and associated operating costs; and food preservation and storage that reduces the risk of contamination.

ASHRAE's VIEW

R&D funding by the Federal government has historically been based on technological innovation as a critical tool for ensuring that the nation has affordable, clean, and reliable energy, as well as to help stimulate innovation in the private sector to produce more energy efficient equipment and systems. Adequate funding is necessary to assure that R&D to advance these goals continues. While R&D programs by ASHRAE and other private sector organizations provide valuable insight and tools for the built environment, some necessary research and development can only be performed with the support and initiative of government. Integrative research that covers multiple industry sectors and high risk basic research are unlikely to be supported in the private sector, but will prove extremely valuable to society.

Specific research and development needs include:

- Advanced energy efficiency and renewable energy R&D to reduce energy use.
- Understanding influences on Indoor Air Quality (IAQ) and tools to assure good IAQ.
- Increased understanding of the relationship between the design of buildings and actual energy use during occupancy to allow for better building design that supports more efficient and less costly operation and the development of more accurate energy use models.
- The need for a robust database of case studies of energy use in real buildings, for better benchmarking.
- Efficiency, design and energy research to support the development of increasingly energy efficient buildings and eventually net-zero energy and carbon neutral buildings
- Research focused to improve teaching and learning of science, technology, engineering and mathematics (STEM) concepts and critical thinking skills to ensure a competent technological workforce
- How will the design, construction and operation of buildings and associated HVAC equipment need to change as the world adapts to a changing climate?

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Shaping Tomorrow's Built Environment Today

SCIENCE, TECHNOLOGY, ENGINEERING AND MATHEMATICS EDUCATION

THE ISSUE

Strong education in science, technology, engineering and mathematics (STEM) to develop the future supply of technicians, engineers, and scientists is critical to our future standard of living. Even students pursuing non-STEM specialties need basic knowledge of scientific and technological applications for effective participation in the workforce, success in their personal lives, and responsible citizenship. The National Academy of Sciences (NAS) report, *Rising Above the Gathering Storm* (2007) expresses a "deep concern that the scientific and technological building blocks critical to our economic leadership are eroding at a time when many other nations are gathering strength." Alarmingly, only about one-third of US fourth, and one-fourth of eighth graders perform at or above a "proficient" level in mathematics. Similarly, about one-fifth of fourth graders, and more than one-fourth of eighth graders lack the competence to perform even basic mathematical computations.[1]

ASHRAE's ROLE

As professionals focused on design, construction, operation, and maintenance of the nation's buildings and infrastructure, and as educators of future generations of engineers, ASHRAE members recognize the importance of a solid foundation in science, technology, engineering and mathematics. ASHRAE members are active in their local communities and in national programs, bringing exciting science and engineering programs to students. ASHRAE is actively engaged in the Solar Decathlon, National Engineers Week, STEM Education Coalition and other STEM education efforts in the US, and supports STEM worldwide through its Chapters and student activities programs.

ASHRAE's VIEW

Parents, educators, governments at all levels, and the private sector have important roles in ensuring that future generations possess the skills and critical competencies necessary to be successful in a highly competitive, global, and technologically sophisticated economy. We must work cooperatively to ensure that children receive the STEM training essential for future success. ASHRAE encourages policymakers to implement the following recommendations:

- Increase governmentally funded research to improve teaching and learning of STEM concepts and critical thinking skills.
- Recruit, train and retain qualified STEM teachers through the development of programs recognizing educators who excel in STEM education, and incentives that encourage the best and brightest scientists and engineers to teach.
- Foster partnerships among educational institutions, industry, and non-profit organizations and their members.
- Encourage the adoption of curriculum standards that cultivate high student performance; the development of curricula that foster creativity, experiential problem solving and critical thinking; and the development of assessments aligned with these standards and curricula.
- Create opportunities and incentives for women and minorities to pursue STEM coursework and careers.

[1] National Center for Education Statistics, "Trail Urban District Assessment: Mathematics 2011, Results at Grades 4 and 8". 2011. http://nces.ed.gov/nationsreportcard/pdf/dst2011/2012452.pdf.

Memorandum of Understanding
ASHRAE and PAKISTAN HVACR SOCIETY

Founded in 1894, ASHRAE, Atlanta, Georgia, U.S.A. advances the arts and sciences of heating, ventilating, air-conditioning and refrigeration to serve humanity and promote a sustainable world.

The PAKISTAN HVACR SOCIETY was established in 1993 to promote the cause of HVACR profession and industry in Pakistan. The Society is the sole representative body in Pakistan on HVACR to promote arts and sciences of Heating, Ventilation, Air Conditioning and Refrigeration Engineering and Related Services for the benefit of the general public.

ASHRAE and PAKISTAN HVACR SOCIETY agree to support the Memorandum of Understanding to advance and promote the mutual interests of their respective members. We are committed to working together toward the following activities and goals:

CONSISTENT LEADERSHIP COMMUNICATION

Recognizing the importance of communication in organizational collaboration, both organizations commit to hold a liaison meeting annually (either in person or via conference call) of designated ASHRAE/PAKISTAN HVACR SOCIETY senior representatives to:

- Ensure ongoing advancement of collaborative projects.
- Keep each respective organization informed of major initiatives.
- Discuss new opportunities for collaboration.

PAKISTAN HVACR SOCIETY shall take responsibility for initiating the first annual liaison meeting. Action items with assigned responsibilities shall be recorded at each meeting.

CONFERENCES AND MEETINGS

Each organization agrees to provide the other with a meeting invitation and two complimentary VIP registrations to the primary annual meeting.

ASHRAE and PAKISTAN HVACR SOCIETY agree to explore opportunities to provide speakers at the other organization's meetings to help provide updates and perspectives on technologies and trends of mutual interest.

Where mutually beneficial, each organization shall help publicize the other organization's meetings and promote attendance.

CHAPTER COLLABORATION

ASHRAE and PAKISTAN HVACR SOCIETY agree to coordinate promotion of joint grassroots meetings of respective members. Exchange of Chapter/Section leader contact information will be considered as one way to accomplish this objective.

ADVOCACY

Where mutually beneficial and to the extent allowed by laws and corporate policies, ASHRAE and PAKISTAN HVACR SOCIETY agree to work together on common public affairs goals and ideologies. During annual liaison meetings, public affairs strategies will be discussed and common goals identified. Collaborative opportunities to be considered include:

- Joint promotion of codes and standards at the local, state, province or other regional division, and federal levels.
- Promoting mutually beneficial positions during the development and passage of local, state, provincal or federal legislation.
- Education of legislators on issues important to the members of each organization.

PUBLICATIONS

Recognizing that electronic and print publications are a primary means of disseminating new technologies, trends and practices, ASHRAE and PAKISTAN HVACR SOCIETY agree to:

- Provide at least one complimentary subscription of the primary membership periodical to be received at the headquarters location of the other organization.
- Explore opportunities to jointly produce publications of mutual benefit.
- Cross-market each organization's publications where appropriate and with industry standard distributor discounts.
- Use periodicals to promote the other organization's events, publications and other activities.
- Explore mutually beneficial ways to translate publications for member benefit.

EDUCATION

As leading providers of conventional and online educational services and in recognition of the vital role professional development has for our respective members, ASHRAE and PAKISTAN HVACR SOCIETY agree to:

- Cross-market educational offerings at the regional, national and international levels.
- Explore opportunities to co-develop new courses or other training programs that take advantage of overlapping and complimentary expertise between ASHRAE and PAKISTAN HVACR SOCIETY.
- Discuss ways that certifications programs can be jointly developed or promoted.

TECHNICAL ACTIVITIES COORDINATION

ASHRAE and PAKISTAN HVACR SOCIETY agree to foster technical cooperation in areas of common interest by:

- Encourage members in each organization to participate on technical committees and task forces.
- Provide opportunities to participate in and comment on proposed standards, guidelines, policies, and position statements developed on technical subjects as they relate to buildings and community developments.
- Establish liaison representatives to key technical committees where mutually beneficial to do so.
- Work together to promote the global harmonization of standards and coordinate activities to avoid creation of duplicated standards.

RESEARCH

Recognizing the importance research plays in accelerating the transformation to a more sustainable built environment, ASHRAE and PAKISTAN HVACR SOCIETY agree to:

- Promote research in areas where research results will add to the body of knowledge in HVACR science and application
- Disseminate research results quickly, focusing on high-impact findings.
- Identify opportunities for research funding from other sources.

TERMINATION

Either party may terminate this MOU, with or without stated cause, upon providing the other party with thirty (30) days written notice of intent to terminate.

TERM

The term of this Memorandum of Understanding shall begin when signed by both parties and shall terminate at the end of three (3) years unless extended at that time by written agreement.

LEGAL STANDING

This MOU reflects a commitment by ASHRAE and PAKISTAN HVACR SOCIETY to continue and enhance their working relationship and individual efforts toward achieving mutual objectives described above. It does not create a binding obligation or agreement between the two organizations, and neither organization has an obligation to negotiate toward or enter into a binding written agreement. In addition, this MOU does not create a partnership, joint venture, fiduciary relationship or similar relationship between ASHRAE and PAKISTAN HVACR SOCIETY. Furthermore, it is understood that this Memorandum of Understanding is conceived as a dynamic document, meant to change as circumstances and priorities warrant. It may be modified or amended by written agreement between both organizations.

FOR ASHRAE

_____

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Phone: 404-636-8400
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_____

Printed Name

_____

Date

FOR PAKISTAN HVACR SOCIETY

_____

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_____

Printed Name

_____

Date

MEMORANDUM OF UNDERSTANDING

ASHRAE

AND

REHVA (FEDERATION OF EUROPEAN HEATING, VENTILATION AND AIR-CONDITIONING ASSOCIATIONS)

****

REHVA is a~~n~~ European federation currently representing 27 national associations, headquartered in Brussels, Belgium with some 100,000 experts in the area of heating~~,~~, ventilation and air-conditioning.

ASHRAE is an international organization headquartered in Atlanta, Georgia, USA with some 57,000 individual professionals as members dedicated to advancing heating, ventilation, air conditioning and refrigeration to serve humanity and to promote a sustainable world.

The two organizations play important roles in creating a more sustainable world by providing the technical expertise, educational products, standards and research needed to produce a comfortable, healthy and energy efficient built environment. The basis of this agreement is the belief that by working together, organizations can amplify their ability to provide these services to its members and the general public while simultaneously eliminating duplication and conflicts. Strong collaboration between ASHRAE and REHVA will also allow each organization to address the major issues facing our industry worldwide, including adapting to a rapidly evolving technology. Both organizations also reaffirm their commercial independence through adequate internal organization.

The purpose of this strategic Memorandum of Understanding (MoU) is to strengthen the relationship between REHVA and ASHRAE and to promote substantial and tangible actions to increase the co-operation between the two organizations~~associations~~ and their members.

Both organizations wish to better serve their members by improving information sharing, education offerings, and strengthening the skills and knowledge of practitioners and engineers.

This Memorandum of Understanding (MoU) provides a framework for these benefits to be realized. It creates a roadmap to advance and promote the mutual interests of ASHRAE and REHVA with a practical commitment to work together on the following activities and goals. These activities and goals will serve our collective membership of individuals, associations and the public to promote a more energy efficient, healthy, comfortable, productivity-enhancing and sustainable world. This agreement[1] intends to create a collaborative environment where both organisations are enhanced.

REHVA and ASHRAE enter into this MoU with the objectives described below. In implementing these objectives, REHVA and ASHRAE will investigate ~~also~~ suitable activities related to ASHRAE's ~~European Region~~ region in Europe and its chapters, sections and individual members.

[1] Nothing in this agreement will violate American or~~and~~ European anti-trust regulations.

Administering to the European Region of ASHRAE and its chapters, sections and members .

ASHRAE wishes to reinforce the level of service for its individual members based in European countries. To date, ASHRAE estimates that it has around 1,800 individual members in Europe, of which approximately 50 to 70% are also members of associations represented by the REHVA federation.

ASHRAE agrees that REHVA may reinforce, in coordination with national associations, ASHRAE's service to its individual members.

REHVA and ASHRAE will arrange a taskforce to define how to organize, administer and communicate with ASHRAE members in the European Region. The schedule to implement this objective is 6 to 18 months after the MoU goes into effect. The overarching goal of this agreement is to elevate and magnify the level of service to individual members and association members from both organizations while operating in harmony. The natural outcome of elevating and magnifying membership value will be an increase in the individual membership of both ASHRAE and the national associations served by REHVA. The formation of ASHRAE chapters, sections, groups or clubs will be communicated and coordinated with REHVA's association members to strengthen and encourage collaboration. It is the intent of this agreement that individuals would be motivated to join both ASHRAE and the national associations served by REHVA.

If the Task Force formed in the following annexes fail to reach an agreement in the time frame stipulated, this MoU will immediately be dissolved. If this MoU is dissolved due to the failure of the Task Forces to reach an agreement, it is agreed that ASHRAE and REHVA will immediately open negotiations to create a new MoU to define the relationship between ASHRAE and REHVA, taking into consideration the needs and expectations of ASHRAE and the national associations represented by REHVA.

Cooperation between National associations members of REHVA and ASHRAE

The aim is to simplify and amplify the potential cooperation between ASHRAE and REHVA and its members while operating in harmony.

ASHRAE and REHVA will work in concert to develop a standard agreement between ASHRAE and any national association represented by REHVA who wishes to enter into an agreement with ASHRAE (Annex 4). Where requested by the national association, REHVA will be integrated into the agreement as a third-party signatory.

ASHRAE will inform REHVA without delay about opening of new agreements or MoUs with organisations in Europe and, similarly, REHVA will inform ASHRAE without delay about opening of new agreements or MoUs with organizations in North America. The intent is not to provide information or details regarding joint meetings, support or conferences or other similar non-strategic

information. The intent is to share information about potential strategic agreements ASHRAE may form in Europe and REHVA may form in North America.

Development of international bodies

REHVA and ASHRAE share the goal of building an international organisation that would be the voice of sustainable technology for the built environment worldwide. Such an organisation may be launched starting from the activities of the ASHRAE Associate Society Alliance (AASA), a concept that is currently being investigated by ASHRAE. If such an international organisation is created, through ASHRAE's AASA or otherwise, REHVA is to be the voice representing its national associations. That fact does not preclude any of its national associations from participating individually in an AASA-type of international organisation.

Each organization remains free to participate in any other international initiative with the same goal, and will inform each other of its intention.

REHVA and ASHRAE also agree to join efforts to create the Indoor Environmental Quality - Global Alliance (IEQ - GA).

Events, publications and dissemination tools

- Promote communication and information exchange between the organizations and their respective members through announcements in journals, web sites, and other communication vehicles.
- Purchase for resale of each organization's publications by the other at a discounted rate to be negotiated by each organization's secretariat staff;
- Cooperation in sale and placement of advertisements in ASHRAE and REHVA publications, web sites and other communication vehicles as appropriate and as mutually beneficial to both organizations;
- Opportunity to place advertisements by each organization in the other's journal, website, and other communication vehicles at special prices;
- Cooperation in the development of and participation in conferences and exhibitions globally which may be mutually beneficial and which strengthen the bonds of international cooperation between the organizations and their respective members.

- ASHRAE endorsement of REHVA CLIMA World Congresses for the purpose of encouraging ASHRAE member attendance thereby providing an opportunity for members of REHVA associations and of ASHRAE to interact on professional and technical matters;

- Both ASHRAE and REHVA will disseminate information of European events and activities organized at the local level by any organization.

Education and International Student competition

- Sponsor and jointly organize training and educational seminars and other educational activities when appropriate.
- Promote educational activities of the other organization whenever possible.
- Participate and promote any type of e-learning development offered by the other organization
- Promote and organize participation to the REHVA/ASHRAE international student world competition.

Research and Technical cooperation

- Promote the co-operation between ASHRAE technical committees and REHVA committees and task forces.
- Develop common task forces for joint publications
- Increase contacts and influence on governmental bodies and other decision makers where appropriate for both organisations including issuing joint or collective statements articulating engineering perspectives on technical and scientific matters being addressed by governmental bodies at an international level.
- Communicate between parties on research programs
- Cooperate on research activities of mutual interest to both organizations.
- Create a common task force to identify cooperation in advance of international normalisation processes (e.g., CEN, ISO,).
-

Duration

This MoU will enter in force at the signature date executed and will cancel and replace the previous MoU. This MoU will terminate the 30st of June 2020.

Organisation

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Both organizations enter into dialogue with respect and a constructive attitude knowing that a positive outcome will strengthen both parties, ultimately resulting in technological advancement for the benefit of humanity.

The two organizations agree to facilitate to each other participation at official meetings through formal participation by the other organization.

To achieve these objectives REHVA and ASHRAE will organize a quarterly high-level electronic or face-to-face meeting to:

- Ensure ongoing advancement of collaborative projects.
- Monitor progress on collaborative projects underway.
- Keep each respective organization informed of major initiatives.
- Discuss new opportunities for collaboration.

Finally, both organizations will each form specific task groups to carry out the works as described in this MoU with approval by their official bodies.

FOR ASHRAE

Timothy G. Wentz, PE
ASHRAE President, 2016-2017

_____
Signature

_____
Date

FOR REHVA

Stefano Corgnati, President 2016 - 2019

_____
Signature

_____
Date

Annex 1: List of tasks forces and members of the task forces

TASK FORCE 1: Administering of ASHRAE members in Europe

REHVA Members: Jaap Hogeling, Stefano Corgnati, Ioan Dobosi (to be confirmed) and Anita Derjanecz.

ASHRAE Members: Tim Wentz, Ken Goodman and Steve Comstock + ~~CIBSE representative~~CIBSE Representative

Tasks:

- Define the communication and organisation that will exist between ASHRAE and REHVA
- Identify suitable activities related to administering the European ASHRAE members through REHVA
- Develop a menu of services, fees and approved methods that could be delivered by REHVA to these members on behalf of ASHRAE
- Develop a method in which REHVA staff may respond to questions from ASHRAE members about ASHRAE services (publication, training….) and the methodology of communicating with both ASHRAE members and the members of the national associations represented by REHVA.
- Consider other MoU's between ASHRAE and other organizations and Identify the potential organisation of ASHRAE members within the region by chapter(s), groups, clubs or some other hybrid format operating in harmony with the national associations
- Recommend language to be included in the agreement template between ASHRAE and any national association represented by REHVA
-

Timeline: 6 to 9 months after MoU entering in force, typically the ASHRAE winter meeting 2018 or REHVA GA April 2018.

Annex 2: List of national associations part of REHVA

Annex 3: List of ASHRAE chapters, sections, groups and members in Europe

Aannex 4: template for agreement between ASHRAE and National associations members of REHVA

Communication

Common strategic goals

Cooperation principles

Specific goals

Use ASHRAE-AiCARR Strategic Partnership Agreement as a template?

Travel report May-June 2017
Bjarne W. Olesen

AICARR 50 Years conference and CLIMAMED2017 conference in Matera, May 9-14, 2017

AICARR conference

AICARR (Italian society of HVAC&R) held for the 50th time a yearly conference, where I presented a part of my presidential speech. I had discussions with the new President Francesca d'Ambrosio, former president Livio de Santoli and staff Luca Pitera about a revised MOU with ASHRAE. They were concerned that the Strategic agreement with CIBSE-ASHRAE would take away direct agreement between AICARR and ASHRAE, so that REHVA would represent all European HVAC societies. Both REHVA president Stefano Corgnati and I assured them that this was not the intend. The same concern was expressed regarding the planned ASHRAE-REHVA MoU. They wanted to be member of AASA and not be represented by REHVA. I think we assured them that ASHRAE and AICARR could have a MoU; but we wanted to finish the other documents and then use an ASHRAE-AICARR MoU as a template for possible other MoU's with national societies that have an ASHRAE Club/Group. So shortly after Long Beach we need to finish the ASHRAE-AICARR MoU.

CLIMAMED2017 conference

This is a conference organized every 3rd year by National HVAC societies around the Mediterranean (France, Turkey, Spain and Italy). The topic this time was renovation of historical buildings. The next time this conference will be organized by the Engineering Society in Portugal (even if not along the Mediterranean). It is stated in the agreement between the societies that the organizer must be a national society. As Greece and Cyprus do not have a strong HVAC engineering society I will try to convince them to include our chapters in Greece and Cyprus in future conferences. REHVA is discussing to make this a REHVA conference covering the south of Europe.

Spain Chapter 10-year anniversary, May 22-24, 2017

The chapter organized a very nice celebration by having a reception with the sponsors the evening before and then a symposium at the day of the celebration. Here I presented by presidential talk. The chapter is doing very well and very good contacts to industry. Also, the relation with the National HVAC society is working well.

University de Oriente and Engineering Societies in Cuba, May 28-June2, 2017

The detailed program for my visit to Cuba is enclosed at the end of the report. I met with several university people and many representatives for different engineering societies (Mechanical, electrical, civil etc.) Both University members and the societies would like to establish connections with ASHRAE. This will of course be difficult considering the latest information from the US government.

Individual membership

Now, we do not have any individual members. Cube is not listed as a developing economy. They are in the second group so the 90$ fee do not apply. We could of course make an exemption. Even 90$ is expensive for individual members considering the salary levels in Cuba. We can have individual membership in Cuba; but we cannot form chapters or sections. In my meeting with our Spanish chapter a possibility to support members in Cuba could be through our chapter in Spain. The persons I meet in Cuba also indicated that they had a good relationship with Mexico. Having a Mexico chapter to support members in Cuba may however not be accepted as Mexico is part of a US-Region. Is there any realistic chance that we will get members from Cuba soon? One possibility I see is that companies presented in Cuba they may support individual membership for persons from Cuba.

Society membership

As mentioned I met with representatives from several engineering societies or their branch leaders in Santiago de Cuba. I also meet the director for the overall engineering society with head office in Havana. She was very eager to establish some form of relation with ASHRAE. One possibility I see is that they become member of AASA (@Jeff will that violate the government ruling in US?). A first step is that I intend to invite one or two representatives from Cuban societies (who understand and speak English) to the planned AASA meeting in April 2018 in Brussels. We need probably to cover expenses. I also intend to invite the HVAC society from Iran, where we also have 40 individual members.

CIBSE-ASHRAE leadership meeting in Lexington, MA, June 11-13, 2017

(Report to follow)

REHVA Board meeting in Torino

We discussed the latest version of the MoU and with a few revisions finalized the text to be signed in Long beach. Also, we discussed the members of the task force. In our meeting with CIBSE the week before CIBSE expressed an interest in having a member of the task force. REHVA would like that this member was appointed as part of the ASHRAE group, because if it looked like REHVA had appointed someone from CIBSE other members of REHVA would probably also ask for having a person on the task force.

At the CIBSE-ASHRAE meeting it was discussed to make a CIBSE-ASHRAE conference in Europe. We agreed that could include REHVA. So, in the year were there would be no CLIMAXXXX or CLIMAMEDXXXX conference we could together organize a ASHRAE-REHVA-CIBSE conference in Europe.

PROGRAMME Visit Mr. Professor Dr. Bjarne W. Olesen, Elect President of ASHARE to the Universidad de Oriente, Cuba

Day	Time	Activity	Place
May 29th	2:00 PM	Reception by university authorities Presentation about the Universidad de Oriente Presentation about the Technical University of Denmark	Reception room
	4:00 PM	Meeting with the Rector (tbc)	tbc
May 30th	9:00 AM	Meeting with Mechanical Engineer Faculty Dean / Vice-deans	Dean Office
	9:30 AM	Conference **Can we take into account diversity when specifying requirements for the indoor environment?**	Conference Room
	2:30 PM	Meeting with CENRE Presentations about CENRE and the Center for Indoor Environment and Energy	CENRE Meeting Room
May 31st	9:30 AM	Workshop ASHARE in Cuba Presentation about ASHARE Barriers to create the Cuban Chapter. Advantages of having the Cuban Chapter	Conference Room
	2:30 PM	Conference **International Standards for the Indoor Environment- Where are We and Do they Apply Worldwide?**	UNAICC (tbc)
	4:00 PM	Meeting with managers of the UNAICC and (SIMEI)	UNAICC (tbc)
June 1st	9:30 AM	Conference **How to meet the ventilation required in international standard in an energy efficient way.**	Conference Room
	11:00 AM	Meeting with CENRE and university authorities Discussion on future collaborative actions.	CENRE Meeting Room
June 2nd (tbc)	9:00 AM	Presentation about IRC Tour by IRC Installations	IRC Location, Havana
	11:00 AM	Meeting with IRC authorities	IRC Meeting Office, Havana

UNAICC-Unión de Arquitectos e Ingenieros Civiles y de la Construcción
Union of Architects and Civil and Construction Engineers

SIMEI- Sociedad de Ingenieros Mecánicos, Eléctricos e Industriales
Society of Electrical, Mechanical and Industrial Engineers

IRC- Instituto de Refrigeración de Cuba
Institute of Refrigeration of Cuba

Annual Report -

ASHRAE Code of Ethics and Discrimination & Harassment Policy Complaints

Filed Status:

QTY

- [6] A. Complaints received by ExCom*
  - [3] Formal Submission
  - [3] Informal Submission
- [1] B. Passed to BOD Tribunal
  - [0] Resolved
  - [1] In-Progress

Filed by:

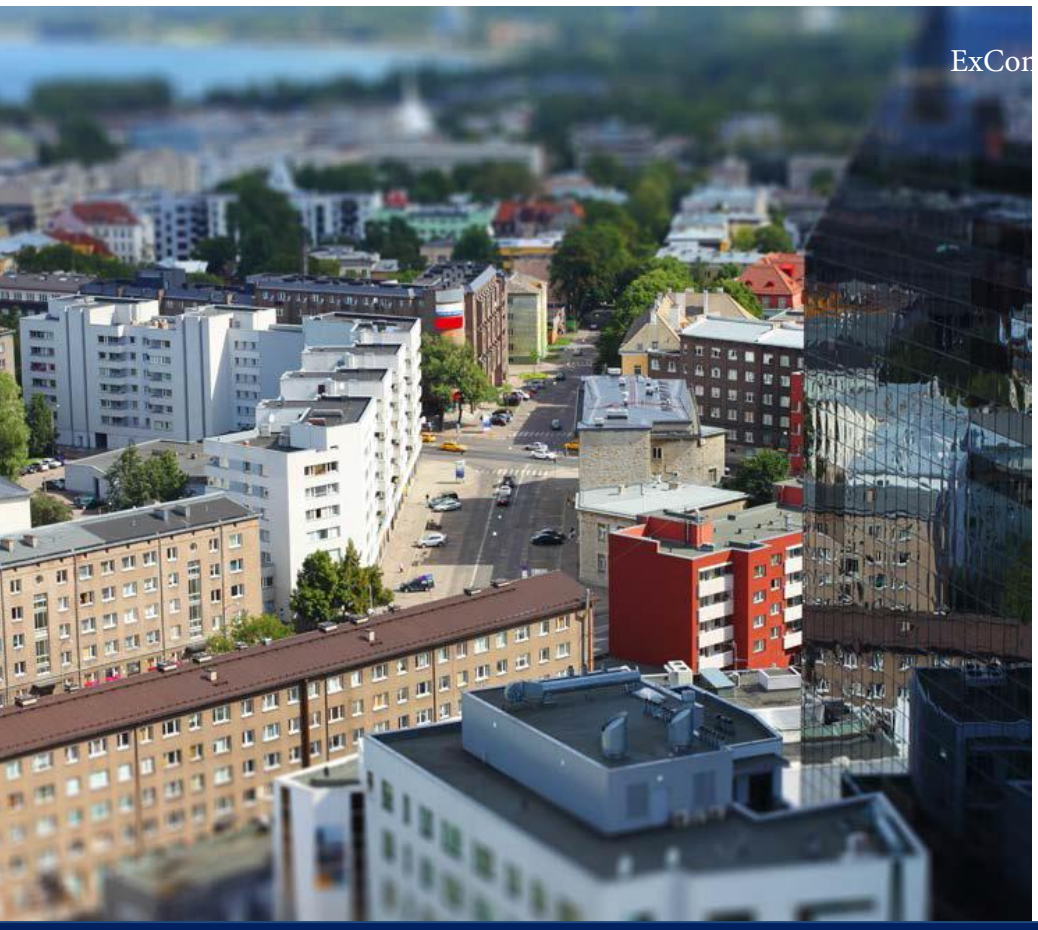
- [1] Staff
- [5] Volunteer
- [6] Total Complaints

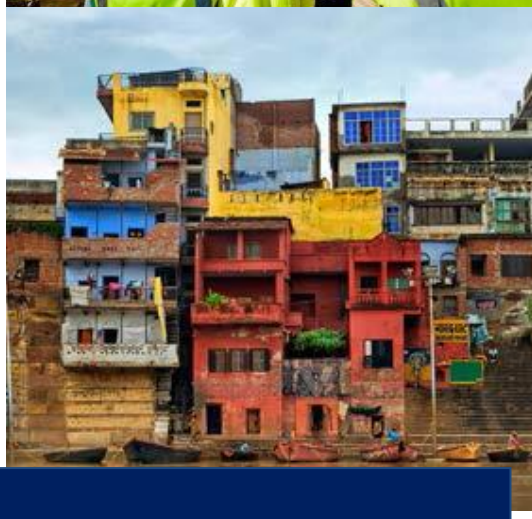
Area(s) Reflected in Complaint (a complaint may include more than one area)

- [4] Honesty
- [3] Fairness
- [5] Courtesy
- [0] Competence
- [4] Integrity
- [0] Conflict of Interest
- [5] Respect for Others
- [0] Confidentiality
- [1] Discrimination
- [2] Harassment

*Rational for dismissal by ExCom

1. Complaint was without merit or basis. No evidence existed to substantiate claim.
2. Written incident report was not a formal complaint under ROB 3.980. Private discussion held with individual against which the allegation was made
3. Written incident report was not a formal complaint under ROB 3.980. Responded to complaintant by letter
4. Alleged conduct did not rise to the level of sexual harassment/unwelcome advances
5. One complaint still under review





Global Alliance for Buildings and Construction

Towards low carbon and resilient real-estate

Liberté • Égalité • Fraternité
RÉPUBLIQUE FRANÇAISE

MINISTERE DE L'ENVIRONNEMENT, DE L'ENERGIE ET DE LA MER

MINISTERE DU LOGEMENT ET DE L'HABITAT DURABLE

UNEP
United Nations Environment Programme

JOIN AND CATALYSE AMBITIOUS ACTIONS

"The Paris agreement adopted at COP21 was a turning point for the future of our planet. The Lima-Paris Action Agenda (LPAA), a new framework implemented to mobilize the actors of civil society and private sector alongside governments, is one of its major components. It will enable immediate action in close collaboration with women and men working for a sustainable future.

The buildings and construction sector is part of this movement. The LPAA focus on buildings and construction on December 3rd confirmed the importance of partnerships and the complementarity of expertise for the buildings sector to respond to the challenge of reducing greenhouse gases emissions.

The Global Alliance for Buildings and Construction, launched on this occasion with the United Nations Environment Programme and many other partners, is a major milestone... I would like to thank you for your involvement from the beginning of this initiative, which showed your willingness to tackle the challenge of climate change..."

Ségolène Royal

Entities interested in becoming a Member in the Global ABC are invited to contact us through globalabc@cop21.gouv.fr .

In addition to any other information, the applicants should fill the registration form that includes:

- ✓ A commitment in which they endorse the Global ABC common statement;
- ✓ Details of the organizational profiles and their field of expertise;
- ✓ Which specific initiative or activity stream (concrete initiatives, working groups, for example) they would like to get involved in;
- ✓ A primary and secondary contact person

The secretariat of the Global Alliance for Buildings and Construction is hosted at UNEP in Paris.

KEY NUMBERS

The responsibility of the building sector

- ✓ More than **30 %** of global GHG emissions are buildings-related.
- ✓ Emissions could grow by 50% by 2050 if we carry on business as usual.
- ✓ **Often accounts for 5% to 10%** of the country national GDP

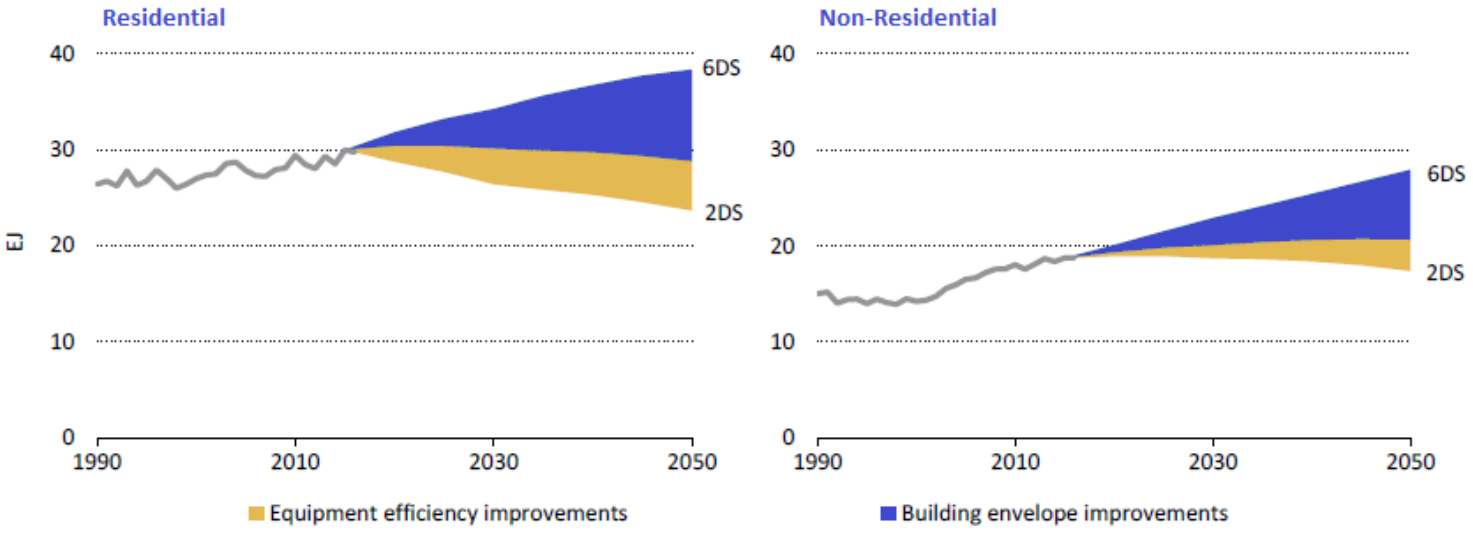
Trends related to buildings sector

- ✓ In the context of population growth, the global stock of buildings is estimated to grow in m^2 by over 90% by 2050.

Meeting the 2°c objective: challenges for the building sector

- ✓ Saving at least **30%** of the energy consumption trend by 2050.
- ✓ Investing an additional sum of around **11,500 billion** dollars by 2050

"Heating and cooling energy savings potential in global buildings (2-Degree Scenario)"



Source: International Energy Agency

THE GLOBAL ABC IN A FEW WORDS

Facilitating the building sector to contribute to the implementation of The Paris agreement

The Paris Agreement adopted at the COP21 was a turning point for the future of our planet. Implemented on the basis of a five-year review process, it aims at **limiting warming well below 2 degrees C** *(article 2.1.a),* in order to reach carbon neutrality from 2050 to 2100 *(article 4.1).*

All countries have submitted their Intended Nationally Determined Contribution (INDCs) and will have to need the contribution of the buildings and construction sector *(article 4.2).* Buildings are long-term ventures. **Today's new buildings are tomorrow's existing stock.** Failure to act now will lock in growth in GHG emissions for decades, as the global real estate should double by 2050.

Mobilizing all value chain actors

The buildings sector offers one of the most cost-effective and economically beneficial paths for reducing energy demand and associated emissions while at the same time supporting adaptation and resilience to climate change.

Many solutions are available. Proven policy, finance and technology actions exist.

Yet the building sector is characterized by an important number of scattered stakeholders and all agree that **public policies are the main driving factor** in orientating the changes.

Buildings environmental footprints are the result of a complex consumption/use chain. Significant changes in these footprints will require to **think in terms of "life cycle" with all relevant stakeholders**.

Building an international framework for concrete actions

The Global Alliance for Buildings and Construction was launched by France and United Nations Environment Programme (UNEP) during the Buildings Day, which took place on the 3rd December 2015, in Paris. Endorsing a common statement, 20 countries, 8 major groups, and more than 50 organizations from the buildings and construction sector agreed to dramatically upscale action, through: Communication, Collaboration**,** and scaling up concrete actions.

As a voluntary international framework for concrete and substantial sectorial actions, the Alliance aims at:

- ✓ Supporting and accelerating the implementation of the Intended Nationally Determined Contributions (INDCs),
- ✓ Strengthening members' human, technical, institutional and legal capacities,
- ✓ Mobilising adequate funding,
- ✓ Raising awareness towards buildings sector potential in reducing GHS emissions,
- ✓ Define a carbon neutrality strategy for the buildings and construction sector.

GABC launch ceremony, 3rd December 2015

GLOBAL ABC WORK PROGRAMME

During its inaugural meeting, held in Paris on 18th and 19th of April 2016, members identified priorities for joint actions, and established 5 working groups beginning to address initial challenges.

1· Education and raising awareness: this group aims to reinforce capacity building and raise engagement of stakeholders by:

- ✓ sharing good practices
- ✓ identifying key messages /advocacy
- ✓ preparing the global status report

Working Group members: Senegal*, Construction21*, CRCLCL*, 10YFP*, iiSBE, Investors Confidence Project, WGBC, RICS, WBCSD, Reseau Habitat Francophonie, GBPN, and la Voute Nubienne

2· Public policies: the group seeks to support member cities, states, regions, and countries in developing capacity, and implementing comprehensive building efficiency strategies and policies in order to decarbonise building sector. This working group aims to:

- ✓ Identify concrete actions and required policies, in terms of regulation and certification,
- ✓ Understand of what good policies should entail,
- ✓ Elaborate a roadmap for sustainable buildings,

Develop a common language Working Group members : Cameroun, Finland, France*, Mexico*, Morocco, Singapore, Tunisia, Thermaflex, IEA*, IFLD, Saint Gobain*, CRCLCL, Veolia, Lafarge Holcim, C2E2, Architecture 2030, The Prince of Wales Corporate Leaders Group, WGBC, and GBPN

(*) Leads of the working group

3· Market transformation: The group seeks to support development of comprehensive action plans across the entire building value chain, workforce development, skills and training, support for technology transfer, and capacity building, by:

- ✓ Raising Stakeholder engagement
- ✓ Scaling up solutions

WG members: Morocco, Senegal, Tunisia*, Ukraine, LafargeHolcim*, WBCSD*, Veolia, Climate KIC, WGBC, IFDD, Saint Gobain, RICS, INTA, and la Voute Nubienne

4· Finance: The group aims to increase financing options adapted to accelerate investment and funding for building mitigation projects and programmes, by:

- ✓ collecting and consolidating reliable data
- ✓ mapping existing opportunities for financing climate compatible buildings
- ✓ promoting innovative finance for specific activities
- ✓ Coordinating actions to access to finance

WG members: Ukraine, IPEEC*, UNEP FI*, Architecture 2030, ICP, Singapore, Climate-KIC, INTA, RICS, and AFD

5· Measurement and accountability: The WG aims at progressing toward a fair and common measurement system ground for any ambitious policy on low carbon transition. The WG is composed by: Ukraine, IEA, RICS, CSTB, CRCLCL, UNEP FI, ULI, ICP, WGBC, C2E2, and Climate KIC

Relevant events for the GABC: *GABC identified key international events, in order to raise awareness and scale up actions by engaging relevant stakeholder to the building potential in meeting the 2°c objective:*

Date	Venue	Event
19 May	Bonn	UNFCCC Subsidiary Bodies session
26 May	Nairobi	Second session of the UNEA
1-2 June	San Francisco	Clean Energy Ministerial
28-29 June	London	Business and Climate Summit
18-19 July	Tanger	MedCop22
15-16 September	Bratislava	European ministry of construction meeting
26 – 28 September	Nantes	Climate Chance
17-20 October	Quito	Building action day, Habitat III
7-18 November	Marrakech	Buildings day, COP22


GABC Inaugural meeting , 18 April 2016, Paris

GLOBAL ALLIANCE FOR BUILDINGS AND CONSTRUCTION
WHO PARTICIPATES?

Countries:
- Argentina
- Armenia
- Austria
- Brazil
- Cameroon
- Canada
- Finland
- France
- Germany
- Japan
- Mexico
- Mongolia
- Morocco
- Norway
- Russia
- Senegal
- Singapore
- Sweden
- Tunisia
- Ukraine
- United Arab Emirates
- United States
- Viet Nam

Organizations (public):
- Agence de l'environnement et de la maitrise de l'énergie (ADEME)
- Centre for Renewable Energy and Energy Efficiency (ECREE)
- Climate Technology Centre and Network (CTCN)
- Global District Energy in Cities Initiative
- Institut de la Francophone pour le Développement Durable (IFDD)
- International Energy Agency (IEA)
- International Partnership for Energy Efficiency Cooperation (IPEEC)
- UN HABITAT
- United Nations environment programme (UNEP)
- United Nations Economic Council for Europe (UNECE)
- 10-Year Framework of Programmes on SCP- Sustainable Buildings and Constrution Programme

Local authorities :
- City of Warsaw (Poland)
- California State (USA)
- Mexico City
- Ontario Province (Canada)
- Tokyo Metropolitan government (Japan)

Non-governmental Organizations (Business or Construction):
- Architecture 2030
- Architects Council of Europe (ACE)
- Brazilian Sustainable Construction Council (CBCS)
- European Construction Industry Federation (FIEC)
- European Alliance of Companies for Energy Efficiency in Buildings (EuroACE)
- Confederation of international contractors association (CICA)
- Cooperative Research Council for Low Carbon Living (CRCLCL)
- ENERGIES 2050
- Energy-Cities
- Global Buildings Performance Network (GBPN)
- Haute qualité environnementale – association (HQE)
- Housing Europe (network)
- International Passive House Association (IPHA)
- International Union of Architects (IUA)
- International Urban Development Association (INTA)
- La Voute Nubienne
- Local Governments for Sustainability (ICLEI)
- Observatoire de l'Immobilier Durable (OID)
- R20 Regions of Climate Action
- Réseau Habitat et Francophonie (RHF)
- Royal Institution of Chartered Surveyors (RICS)
- Royal Institute of British Architects (RIBA)
- Sustainable Energy for All (SE4ALL)
- The Prince of Wales's Corporate Leaders Group
- Urban Land Institute (ULI)
- World Business Council for Sustainable Development (WBCSD)
- World Green Building Council (WGBC)
- World Resources Institute (WRI)

Companies:
- Broad Group China
- Consolidated Contractors Company
- Danfoss
- Lafarge Holcim
- Saint Gobain
- Sekisui House
- Thermaflex
- Velux
- Veolia

Finance:
- Agence Française de développement (AFD)
- Global Environment Facility (GEF)
- International Finance Corporation (IFC)
- Investors Confidence Project (ICP)
- UNEP Finance initiative (UNEP-FI)

Technology and Research:
- Buildings Performance Institute Europe (BPIE)
- Centre Scientifique et Technique du Bâtiment (CSTB)
- Climate-KIC
- International Initiative for Sustainable Built Environment (IISBE)
- Passivhuscentrum Västra Götaland

COMMON STATEMENT

The buildings and construction sector is an economic powerhouse. It represents more than 50% of global wealth. The sector also offers one of the most cost-effective and economically beneficial paths for reducing energy demand and associated emissions while at the same time supporting adaptation and resilience.

Buildings and construction sector is also responsible for 30% of global CO2 emissions. This figure is growing rapidly and could reach 50% of CO2 emissions by 2050. This rise increases risks and the vulnerability of countries, regions and local communities to the impacts of climate change. Rapid urbanisation, especially in emerging economies will accelerate this impact.

According to the International Energy Agency (IEA), **moving to a below 2°C path requires reducing the building sector's energy consumption** by at least 30% through means of mainstreaming highly energy-efficient new buildings and a deep renovation of the existing stock of buildings by 2050. Buildings are also the result of investment and production processes involving numerous players. To make progress it is therefore essential to engage all partners along the entire value chain and provide clear performance criteria and monitoring over the full development life cycle, including through the construction supply chain. This effort requires an additional public and private investment of around 11,500 billion USD, in addition to what is done today, over a 2015-2050 period. However, it could provide energy cost savings that exceed this investment by more than 100% by 2050.

Many solutions are available, and the economic, health, and social benefits of sustainable buildings are significant, and have been demonstrated in most regions of the world. With early and efficient policies, the buildings and construction sector should therefore be more fully engaged in climate commitments.

The COP21 provides an important opportunity to highlight this issue, giving greater visibility to stakeholder's engagement, to initiatives underway and to demonstrate how they provide important triggers for action.

Governments, major building and construction networks stakeholders, potential funders, and existing support initiatives, collectively committed to helping to put the buildings and construction sector on the "below 2 °C path" are therefore forming a Global Alliance for Buildings and Construction.

The Alliance will help facilitate the mobilisation of ambitious levels of international resources for efficient local operational solutions, aligning existing initiatives, commitments and programmes to achieve greater scale, and catalysing greater pace and impact of climate action in the buildings and construction sector. The first 'Buildings Day', which took place at COP21 on 3rd December 2015, provided an opportunity to launch this unprecedented alliance.

Global Alliance for Buildings and Construction

Contact : globalabc@cop21.gouv.fr

UNEP

Towards zero-emission efficient and resilient buildings

GLOBAL STATUS REPORT 2016




Global Alliance for Buildings and Construction

» ACKNOWLEDGEMENTS

The Global Status Report 2016 was prepared by the GABC on the occasion of the 22nd Conference of Parties (COP22) to the United Nations Framework Convention on Climate Change (UNFCCC). The report was coordinated by UN Environment and made possible through the generous support of the Government of France.

The authors of the report are Brian Dean and John Dulac (International Energy Agency), Ksenia Petrichenko (Copenhagen Centre on Energy Efficiency) and Peter Graham (Global Building Performance Network).

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Vahram Jalalyan – United Nations Development Programme, Armenia

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Ursula Hartenberger – Royal Institution of Chartered Surveyors

Frank Hovorka – Caisse des Dépôts

David Donnerer – Energy Cities

» DISCLAIMER

UNEP

Global Alliance for Buildings and Construction

» GLOBAL ALLIANCE FOR BUILDINGS AND CONSTRUCTION WORKING GROUPS

The Global Alliance for Buildings and Construction (GABC) was launched at the 21st Conference of Parties (COP21) Buildings Day in Paris on the 3rd of December 2016. It was initiated by France and the United Nations Environment Programme (UN Environment) to bring together the building and construction industry, countries and stakeholders to raise awareness and facilitate the global transition towards for low-emission, energy-efficient buildings.

With its creation, GABC members acknowledged that the buildings and construction sector can contribute significantly to achieving climate goals and the common objective of limiting global warming to well-below 2 Celsius (2°C).

Indeed, the GABC aims at supporting and accelerating the implementation of the NDCs, and thus facilitate the implementation of the Paris Agreement for the buildings and construction sector in terms of energy efficiency gains, growth of renewable energy and GHG emissions reduction. Moreover, the GABC aims at dramatically reducing the GHG emissions of the global building stock by increasing the share of eco-friendly buildings, whether new or renovated.

Today, the GABC gathers together 23 countries and 64 non-state organisations (sub-national, non-governmental organisations and private sector) from all over the world and is intended to increase the pace and scale of actions through communication, collaboration and implementation.

GABC activities are organized around different working groups contributing to the transition towards low-GHG and resilient real estate: Education and Awareness; Public Policies; Market Transformation; Finance; and Measurements, Indicators and Accountability. These working groups have been established during the inaugural meeting and seminar of the GABC, held in Paris on the 18th and 19th of April 2016.

During the inaugural meeting in Paris, GABC members agreed on the need for two ad-hoc frameworks: a Global Roadmap for the transition towards low-emission and resilient real estate and this Global Status Report, along with a Building and Climate Yearbook that will be produced on an annual basis hereafter.

This is the first draft of the Global Status Report, which will track each year the progress made in the transition towards low-emission and resilient real estate. The next complete edition will be issued on November 2017.

The GABC Secretariat is hosted by the UN Environment, Economy Division in Paris and served by the GABC Coordinator. Contribution of new data and information to enrich this document are welcome.

For more information, please contact the following email address: globalstatusreport@globalabc.org.

»GLOBAL PERSPECTIVE

Energy use in **buildings and for building construction** represents more than one-third of global final energy consumption and contributes to nearly one-quarter of greenhouse gases (GHG) emissions worldwide [1].

A growing population, as well as rapid growth in purchasing power in emerging economies and developing countries, means that energy demand in buildings could increase by 50% by 2050 [2], while global building floor area is expected to double by 2050, driving energy demand and related GHG emissions for construction.

1 This data covers more than building-related energy. This concept will be further explained in the GABC Roadmap.

2 IEA (2016), Energy Technology Perspectives 2016, IEA/OECD, Paris.

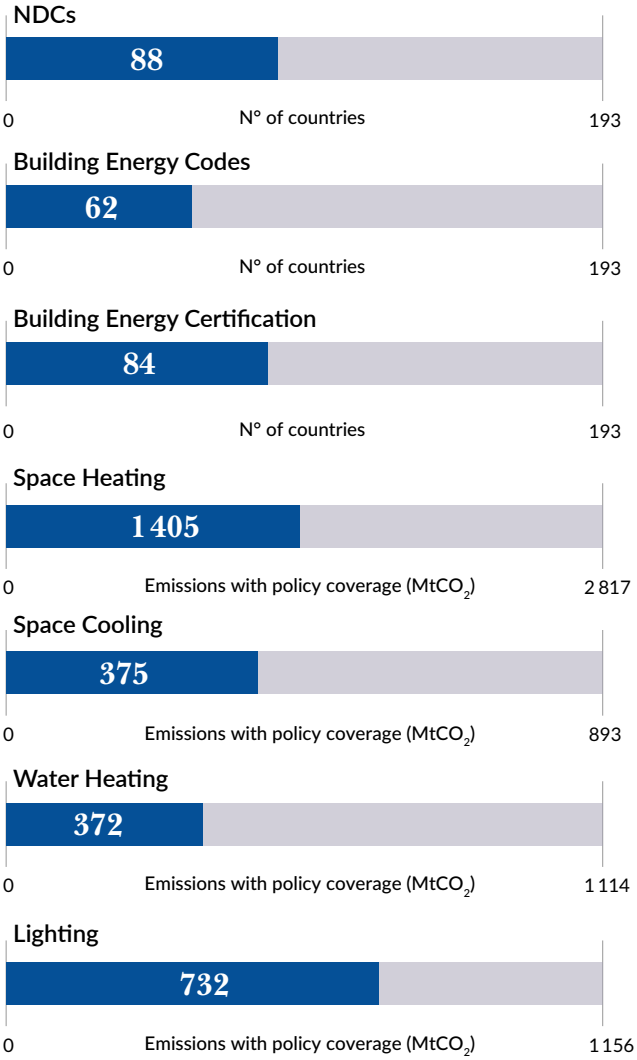
Table **Building floor area growth to 2050 by region**[3]

Billion m2	2015	2030	2050
North America	38.1	47.1	56.9
Western Europe	29.8	34.3	36.9
Eurasia	9.8	13.1	14.9
China	57.2	79.3	84.6
India	15.8	32.1	57.6
Japan and Korea	9.8	10.9	11.1
Southeast Asia	15.6	23.8	32.3
Australia and New Zealand	2.1	2.7	3.4
Latin America and Caribbean	19.3	29.1	43.1
Middle East	8.0	12.7	18.3
Africa	18.0	30.4	56.0
World	**223.4**	**315.4**	**415.2**

Yet, the building sector offers the largest cost-effective GHG mitigation potential, with net cost savings and economic gains possible through implementation of existing technologies, policies and building designs[4].

Building energy efficiency technologies and policies have been demonstrated as cost effective means for collectively improving energy security and productivity, while also improving health and wellbeing, reducing local air pollution, creating jobs and adapting to climate change. Governments are looking increasingly at ways to accelerate investment in net-zero/low-carbon buildings, and the essential role of the building sector is well recognised as a critical element to achieving the Paris Agreement's goal of limiting global warming to well-below 2°C.

Nearly 90 countries have now included building sector actions in their Nationally Determined Contributions (NDCs), and a coalition of over 90 states and non-state actors has formed the Global Alliance for Buildings and Construction to raise awareness of the building sector's huge climate action potential and focus specifically on engaging relevant stakeholders to help achieve a well-below 2°C pathway.



3 *IEA (2016), Energy Technology Perspectives 2016, IEA/OECD, Paris.*

4 *Intergovernmental Panel on climate Change (IPCC) (2014), Climate Change 2014: Mitigation of Climate Change, 5th Assessment Report, WG III.*

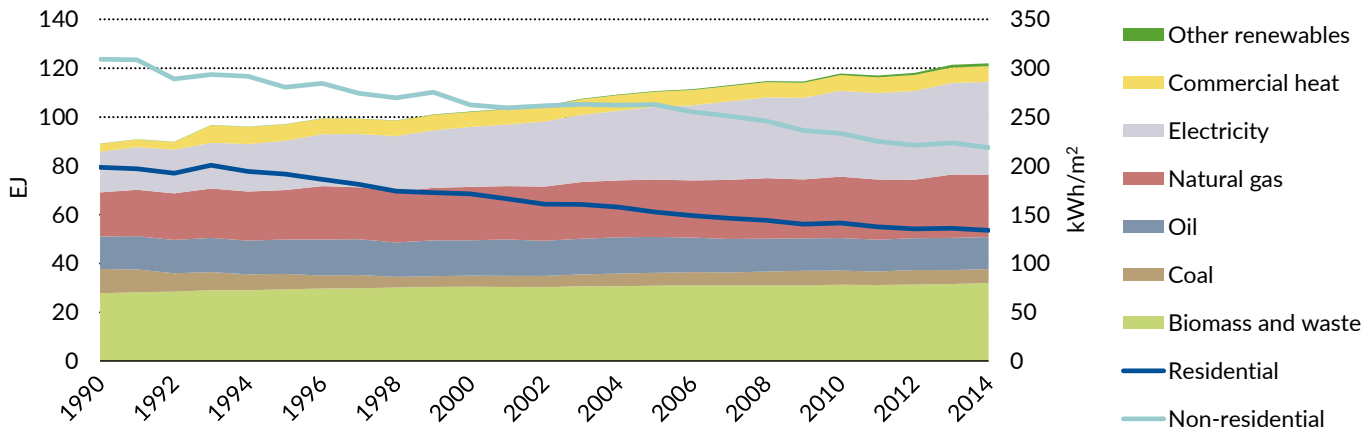
In addition, more than 3 000 city-level and 500 private sector commitments and actions in the building sector have been registered under the United Nations Framework Convention on Climate Change. The finance sector is also mobilising investors, representing over USD 3 000 billion in assets to increase financing for energy-efficient buildings. A number of industry and professional bodies are also mobilising their networks of company and professional members to support market development for high-performance buildings, including initiatives to implement net-zero/carbon-neutral building certification programmes, platforms for private sector engagement with cities to develop and implement local decarbonisation action plans, and communication and education campaigns on net-zero buildings and deep renovation of existing buildings[5].

Despite this surge of awareness and commitment across stakeholders, the energy savings and GHG mitigation targets being set for the building sector are not yet ambitious enough to achieve the Paris Agreement's pledges. A below 2°C pathway requires reducing global energy and process-based carbon dioxide (CO_2) emissions by 60% in 2050 compared to 2012[6].

For the building sector, this means avoiding at least 50% of projected growth in energy consumption through mainstreaming of highly energy-efficient, near-zero, net-zero energy and energy-plus buildings in new construction as well as massive uptake of deep renovation of the existing building stock by 2030[7].

Ensuring this transformation requires investing around an additional USD 220 billion annually by 2020 – an almost 50% increase on 2014 investments in energy-efficient buildings[8]. This does not necessarily require new funding, but rather a reallocation of less than 3% of the current total global annual investment in construction activity (roughly USD 8.5 trillion in 2014)[9]. Returns on this investment could be more than 100%[10] if investments in ambitious policy and technology actions are made

Figure 2 **Global building sector energy consumption and intensity by sub-sector, 1990-2014**



Note: Building sector energy consumption and intensities represent final energy consumption; EJ = exajoules; kWh/m2 = kilowatt-hour per square metre.
Source: International Energy Agency (IEA), calculations derived from IEA World Energy Statistics and Balances 2016, www.iea.org/statistics.

Key point

Building energy intensities have improved since 1990, but not enough to offset strong growth in building floor area. As a result, global building energy consumption and related GHG emissions continue to rise.

5 *For a list of GABC member initiatives, see: http://web.unep.org/climatechange/buildingsday/take-action.*
6 *IEA (2015), Energy Efficiency Market Report 2015, IEA/OECD, Paris*
7 *Ibid.*
8 *IEA (2015), Energy Efficiency Market Report 2015, IEA/OECD, Paris*
9 *Construction Intelligence Center (2014), Global Construction Outlook 2020, Timetric, April.*
10 *Diana Urge-Vorsatz, Andras Reith, Katarína Korytárová, Mynika Egyed, János Dollenstein (2015), Monetary Benefits of Ambitious Building Energy Policies, research report prepared by Advanced Building and Urban Design (ABUD) for the Global Building Performance Network (GBPN), January.*

now, and possibly even higher when accounting for the potential multiple benefits, such as improved health and wellbeing[11]. Alternatively, if business-as-usual or even only moderate performance improvements in new and existing buildings continue to be implemented, there may never be a positive return on investment, and even a possible loss of about 6% by 2050[12].

Priorities for Action

The most efficient and low-carbon building and construction markets have often taken decades to develop. However, a global transformation to a highly energy-efficient, low-carbon building sector must occur over the next decade to ensure a well-below 2°C ambition. This is especially true in emerging economies, where there is a critical window of opportunity to address the largest new construction markets to avoid locking in inefficient buildings for decades.

50% or more

Building sector energy savings potential in 2050 in support of a below 2°C pathway.

There are many strategies for reducing the climate related impact of buildings and construction. Key priorities identified in the draft GABC roadmap include:

1 Urban planning policies for energy efficiency

Use urban planning policies to impact the form and compactness of buildings to enable reduced energy demand and increased renewable energy capacity.

2 Improve the performance of existing buildings

Increase the energy efficiency renovation rate and increase the level of energy efficiency in existing buildings.

3 Achieve net-zero operating emissions

Increase the uptake of building or system level net-zero operating emissions for new buildings.

4 Improve energy management of all buildings

Reduce the operating energy and emissions through improved energy management tools and operational capacity building.

5 Decarbonise energy

Integrate renewable energy and reduce the carbon footprint of energy demand in buildings.

6 Reduce embodied energy and emissions

Reduce the environmental impact of materials and equipment in the buildings & construction value chain by taking a life-cycle approach.

7 Reduce energy demand from appliances

Collaborate with global initiatives to reduce the energy demand from appliances, lighting and cooking.

8 Upgrade adaptation

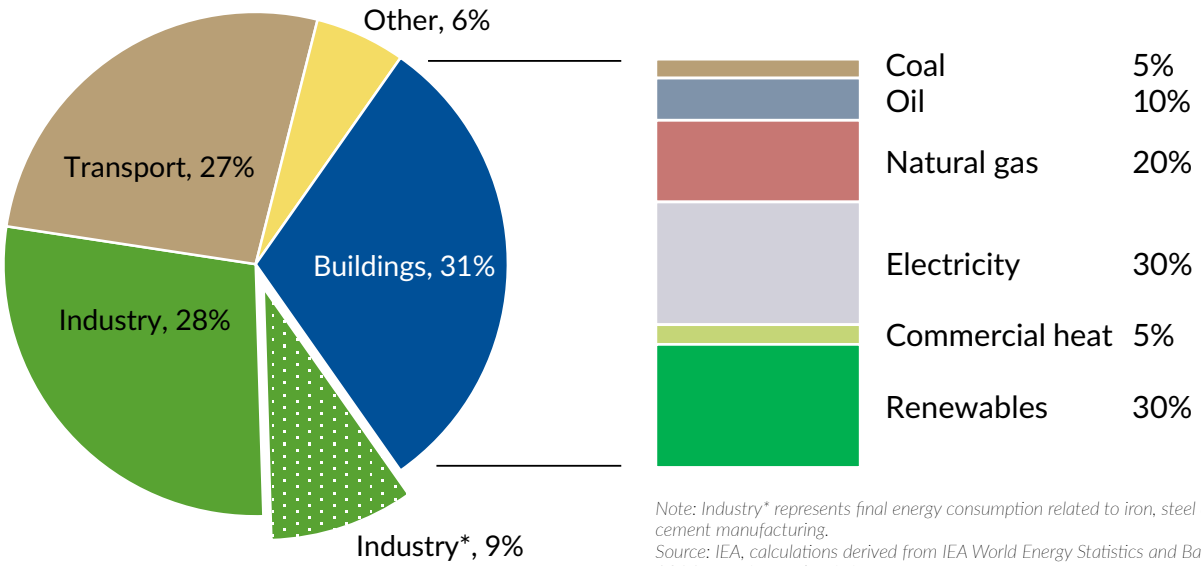
Reduce climate-change related risks of buildings by adapting building design and improving resilience.

11 World Green Business Council (2014), Health, Wellbeing and Productivity in Offices, www.betterplacesforpeople.org.
12 Ibid.

»GLOBAL STATUS

The global building sector consumed nearly 122 exajoules (EJ) (equivalent to 34 x 10^6 gigawatt-hours [GWh]) in 2014[13], over 30% of total final energy consumption[14] for all sectors of the economy, having increased by more than 35% since 1990[15]. Buildings also accounted for half of global electricity demand, with electricity consumption increasing by more than 500% in some regions since 1990. When upstream power generation is taken into account, the building sector therefore represents roughly 30% of global energy-related CO_2 emissions.

Figure 3 **Global final energy consumption and building energy use by fuel share, 2014**



Note: Industry represents final energy consumption related to iron, steel and cement manufacturing.*
Source: IEA, calculations derived from IEA World Energy Statistics and Balances 2016, www.iea.org/statistics.

Key point

Buildings and construction, including manufacturing of materials, account for more than one-third of global final energy consumption.

Globally, building energy performance (as measured by final energy per floor area) has continued to improve by around 1.5% per annum since 1990. Building energy codes and energy efficiency policies have helped to offset growth in total energy consumption. However, the simultaneous effect of growing global wealth, which typically corresponds to increased demand for larger spaces, smaller household size (i.e. fewer persons per household), and increased demand for energy services and comfort, have offset many of those efficiency gains.

If no action is taken to improve the energy performance of buildings, global building sector energy demand could increase another 50% by 2050[16]. Nearly 80% of this growth occurs in developing countries and emerging economies, where there is an important window of opportunity to address a rapidly growing building sector.

Under a below 2°C trajectory, effective action to improve building energy efficiency could limit building final energy demand to just above current levels, meaning that the average energy intensity of the global building stock would decrease by more than 80% by 2050.

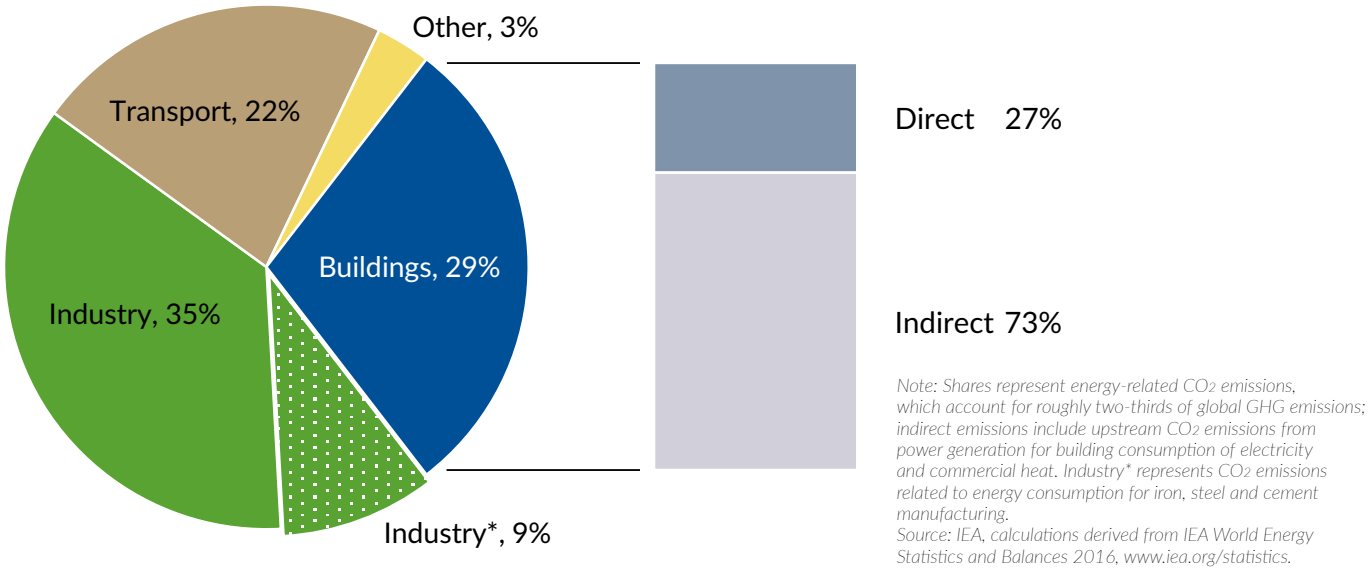
13 *The final energy consumption accounted for in the IEA's global building sector analysis and outlooks includes energy consumption for space heating and cooling, water heating, lighting, cooking, household appliances and other building-related equipment and plug-loads. Energy efficiency and low-emissi-on actions for cooking, appliances and other buildings-related equipment are not treated explicitly in this report or in the GABC Roadmap.*

14 *Energy consumption here refers to final energy use, unless otherwise noted.*

15 *IEA (2016), Energy Technology Perspectives 2016, IEA/OECD, Paris.*

16 *Ibid.*

Figure 4 **Building emission share, 2014**

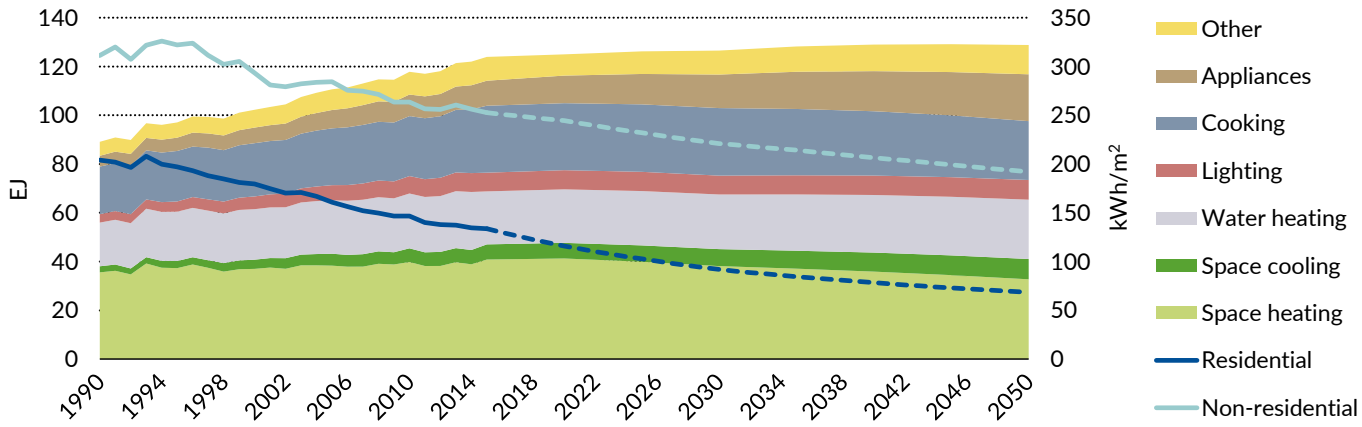


Note: Shares represent energy-related CO_2 emissions, which account for roughly two-thirds of global GHG emissions; indirect emissions include upstream CO_2 emissions from power generation for building consumption of electricity and commercial heat. Industry represents CO_2 emissions related to energy consumption for iron, steel and cement manufacturing.*
Source: IEA, calculations derived from IEA World Energy Statistics and Balances 2016, www.iea.org/statistics.

Key point

When indirect building emissions from power generation are included, buildings and construction represent nearly 40% of energy-related CO_2 emissions.

Figure 5 **Global building sector final energy consumption and intensity to 2050 in support of a 2°C trajectory**



Note: kWh/m² = kilowatt-hour per square metre. / *Source: IEA (2016), Energy Technology Perspectives 2016, www.iea.org/etp.*

Key point

Building energy intensities need to decrease by at least 80% by 2050 in order to reach 2DS targets. Building envelope improvements to reduce heating and cooling loads will be critical to achieving those ambitions.

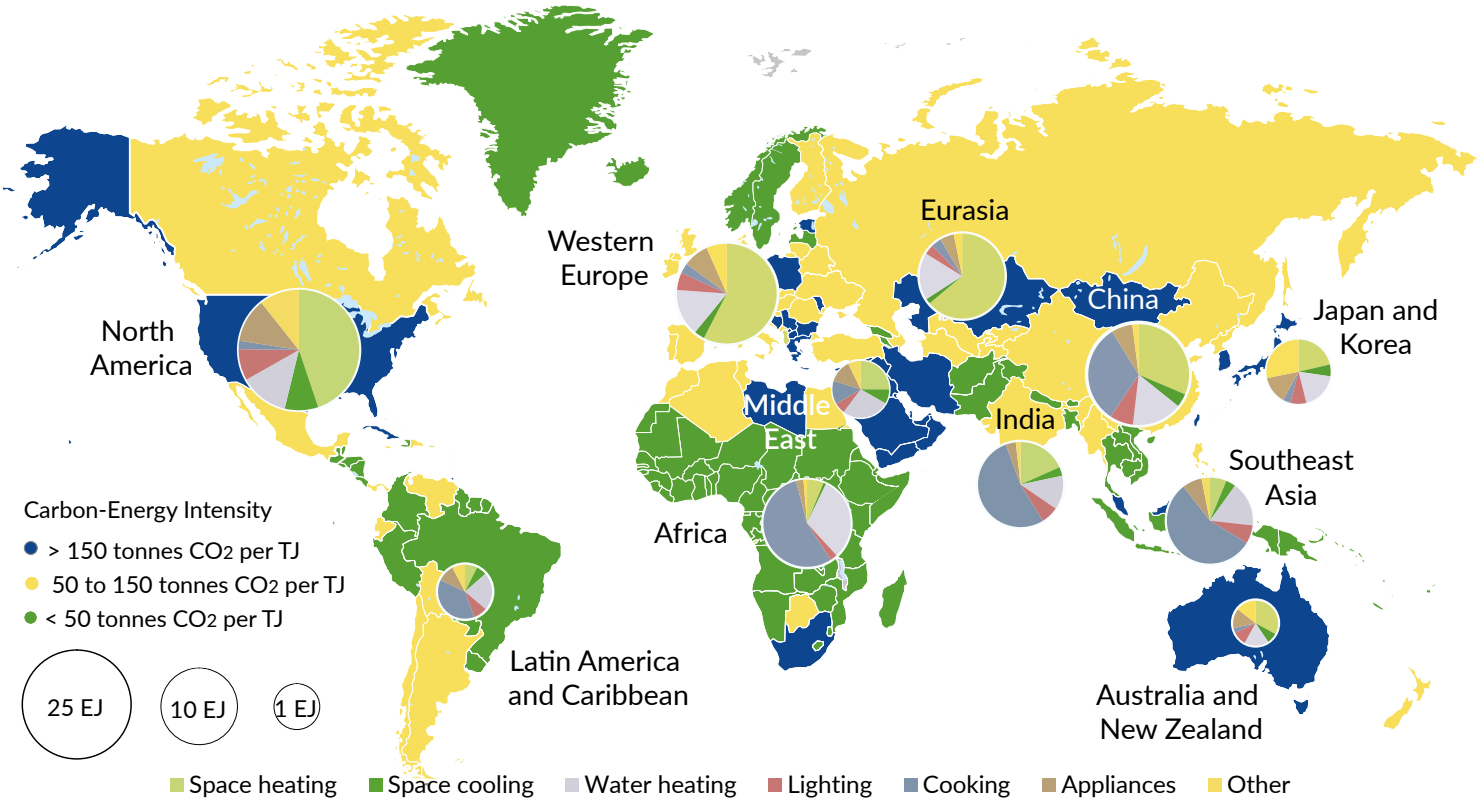
Space heating and cooling demand in buildings continues to be a critical priority area for energy efficiency action in the building sector[17]. Space heating currently accounts for more than one-third of global energy use in buildings and will continue to be a major energy-consuming end use to 2050[18]. Space cooling, while a significantly smaller portion (roughly 5% today) of global energy demand in buildings today, is the fastest-growing end use in buildings and could increase by as much as tenfold to 2050 in some warm-climate, rapidly emerging economies.

Growth in cooling demand will have an important effect on the grid, because peak electricity demand for space cooling can stress ageing or at-capacity power sector infrastructure. Concerted effort is therefore needed to improve building envelope efficiencies, ramp up energy performances of cooling equipment and reduce growing global demand for mechanical conditioned thermal comfort where possible (e.g. through natural cooling solutions).

17 *Note: cooking and water heating often comprise a large share of building energy consumption in many developing countries, due largely to traditional use of biomass. These end-uses and traditional use of biomass are not treated explicitly in this status report.*

18 *IEA (2016), Energy Technology Perspectives 2016, IEA/OECD, Paris.*

Figure 6 **Building energy-carbon intensities by country and building sector energy consumption by sub-sector, 2014**



This map is without prejudice to the status of or sovereignty over any territory, to the delimitation of international frontiers and boudaries, and to the name of any territory, city or area.

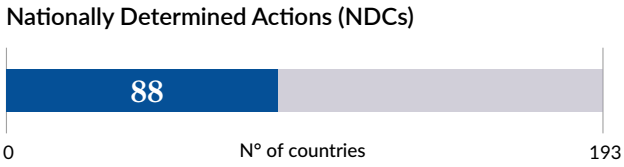
Note: 1 tonne CO_2 per terajoule = 3.6 grams CO_2 per kWh. Energy-carbon intensities represent the building-related CO_2 emissions (including direct emissions from fossil fuel combustion and indirect emissions from upstream power generation for electricity and commercial heat) per unit of final energy consumption in the building sector. These do not include primary energy for production of electricity of electricity and commercial heat.

Source: IEA, calculations derived from IEA World Energy Statistics and Balances 2016, www.iea.org/statistics; IEA, Energy Technology Perspectives 2016, www.iea.org/etp/.

Key point

Growing demand for electricity use in buildings, especially for space cooling, lighting and household appliances, will place an increasing onus on the power sector, which remains carbon intensive. Energy efficiency in buildings will play a critical role in reducing carbon emissions in the power generation sector.

»BUILDINGS-RELATED CLIMATE COMMITMENTS



State Actors - Nationally Determined Contributions (NDCs)

Many countries have included energy efficiency and/or building specific measures in their intended[19] or now submitted NDCs (Figure 7). 88 countries (including the European Union) have specifically mentioned building and construction related actions in their NDC. Most of these NDCs reference general actions to improve building energy efficiency, or reduce building energy related GHGs. More than 30 countries described specific policy goals or actions including adopting new or further promoting existing building energy codes and policies such as rating and disclosure programs.

Countries such as Afghanistan, Bangladesh, Gambia, Jordan and South Sudan mentioned specific actions to encourage financing or investment, including public sector investment in energy efficient building, renewables and/or retrofitting programs. The need for awareness raising and capacity building was also acknowledged by countries such as Afghanistan, Cameroon, Dominica, Ivory Coast, Japan, Jordan, Lesotho, Macedonia, Qatar, Singapore, and Yemen.

While most NDCs that mentioned buildings & construction did so in general terms, a number of countries have set clear goals for achieving mitigation from their buildings & construction sectors, and actions for achieving them.

The examples listed in the opposite page are non-exhaustive and illustrative of energy efficiency and/or building specific measures in countries' NDCs.

19 *Refers to intended NDCs (INDCs) prior to entry into force of the Paris Agreement.*

20 *UNFCCC Climate Action – NAZCA http://climateaction.unfccc.int*

Non-State Actors – Cities

According to the Non-State Actor Zone for Climate Action database[20], more than 500 cities have committed to reducing emissions from construction supply chains and/or climate neutrality. More than 300 cities have committed to policy actions such as building energy efficiency regulation, rating and disclosure programmes, and almost 800 have joined calls to action. Examples include:

- **C40 Cities** reported 2 216 actions being taken in the building sector
- **Covenant of Mayors for Climate & Energy**: In over 5 500 Sustainable Energy and Climate Action Plans, signatory cities are planning actions in their building sectors to reduce GHG emissions by 40% until 2030.
- **ICLEI**: 1 293 community and government operations commitments (pre- and post-2020) were reported to the Carbon Climate Registry. 67% of commitments were made for GHG reductions; 17% for renewable energy; and 14% for energy efficiency. Roughly half supported by reported actions in the building sector.

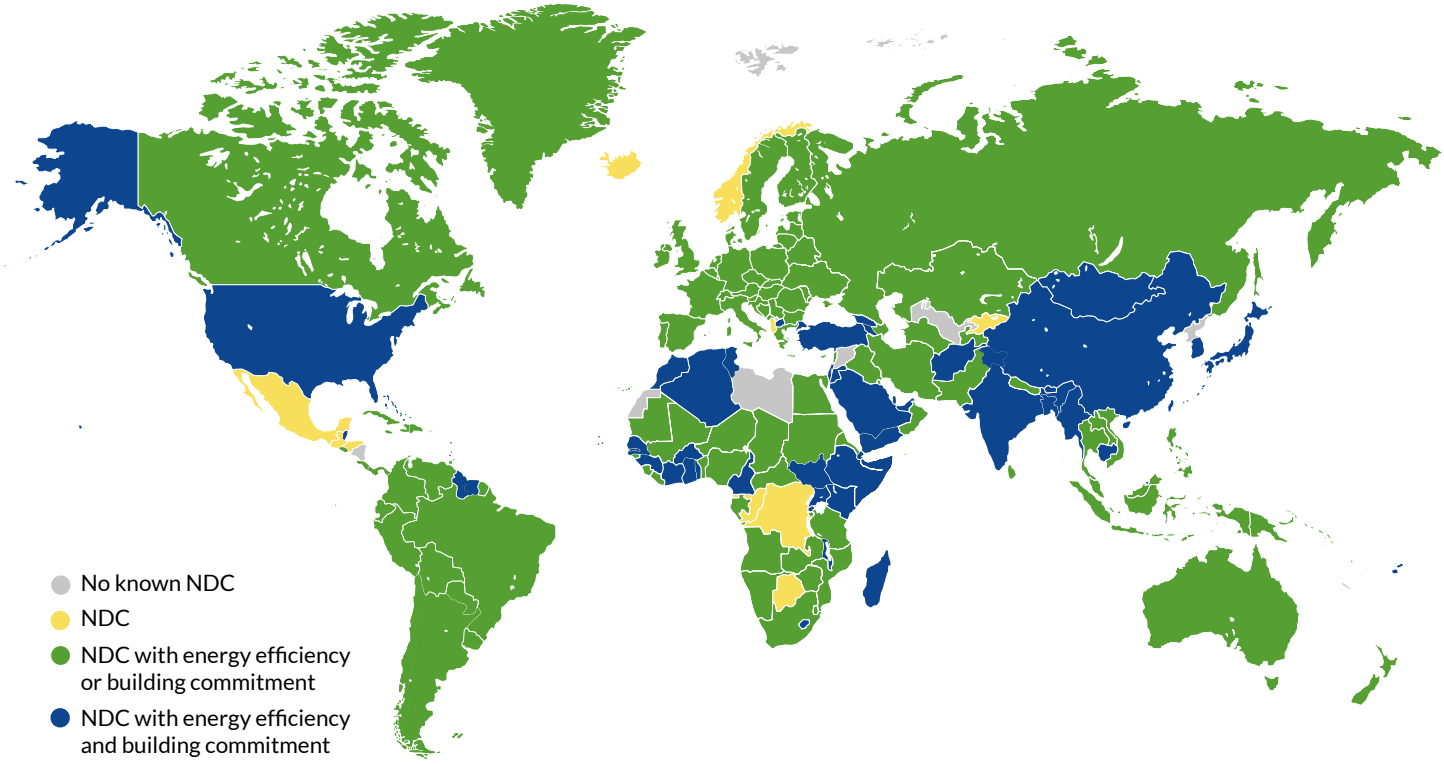
Private Sector Commitments

Nearly 800 commitments to achieve mitigation through action in buildings & construction have been made by private sector partner platforms and companies. These include commitments to:

- reduce energy use in the buildings and facilities they own and/or operate, increasing use of building-integrated renewable energy
- increase investment in low-energy and low-carbon building and construction programmes
- join calls to action on climate change and undertake or facilitate capacity building for green buildings.

Examples include: World Green Building Council (WGBC), national Green Building Councils and member companies commit to advance by 2030 and achieve by 2050 net-zero carbon new buildings and energy efficiency and deep refurbishment of existing stock.

Figure 7 **NDC actions including building and energy efficiency commitments**



This map is without prejudice to the status of or sovereignty over any territory, to the delimitation of international frontiers and boudaries, and to the name of any territory, city or area.

Grenada plans to:

- Implement energy efficiency actions, including retrofitting of all buildings (20% reduction)
- Implement energy efficiency building codes for all building sectors (30% reduction)
- Implement energy efficiency in hotels (20% reduction).
- Introduce tax reduction incentives for solar panels and solar water heaters and for installation of more efficient lighting in some government buildings.

Djibouti plans to:

- Reduce energy consumption of public buildings, beginning with the retrofit of the Ministerial building and the installation of a rooftop solar farm connected to the grid.
- Perform thermal rehabilitation of “3 000 existing buildings (residential and commercial) per year.

India plans to:

- Increase the stringency of the Energy Conservation Building Code to promote construction of near-zero energy-efficient buildings.

Seychelles plans to:

- Introduce a new Building Code for household dwellings (features natural ventilation and roof insulation), with the target of 50% energy savings on fans and air conditioning in households by 2035
- Require all new builds to incorporate rainwater harvesting, solar PV and other sustainable building features.

Mongolia plans to:

- Reduce heat loss in buildings by 20% by 2020 and by 40% by 2030, compared to 2014.
- Improve insulation for existing panel apartment buildings of 18 184 households in Ulaanbaatar.

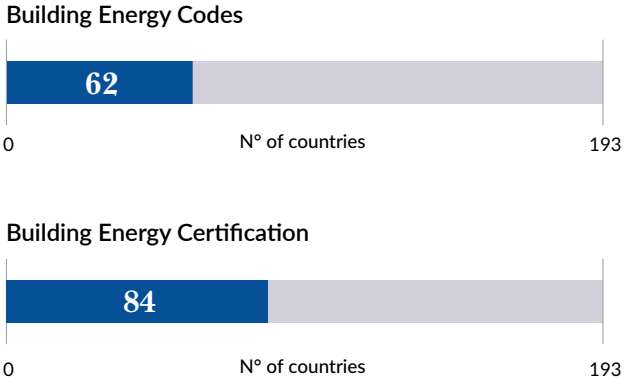
China plans to:

- Improve energy efficiency in buildings and promote construction of green buildings
- Intensify energy conservation transformation for existing buildings
- Promote the application of renewable energy in buildings
- Increase the share of green buildings in new construction in cities and towns to 50% by 2020
- Extend building life spans
- Encourage public institutions to lead by example and advocate low carbon government buildings, campuses, hospitals, stadiums and military buildings.

Morocco plans to:

- Reduce energy consumption in buildings, industry and transport by 12 % by 2020 and 15 % by 2030.

»KEY SUSTAINABLE BUILDING POLICY DEVELOPMENTS



In order to realise energy efficiency potential and achieve energy efficiency targets outlined in this report, countries need to establish a comprehensive policy framework on energy efficiency in buildings. A comprehensive policy framework can also assist various actors in overcoming barriers, which may include market failures, hidden costs, upfront (first) costs, and behavioural, informative and structural barriers.

A single policy instrument is rarely able to drive the transformation of the building sector towards high levels of energy efficiency. A properly designed combination of policy instruments is therefore needed to deliver the full spectrum of change needed and to provide the basis for achieving often complex policy goals.

An effective policy package for energy efficiency in buildings typically provides a sound balance between regulatory instruments (e.g. building codes and standards), incentives (e.g. financing schemes and credits) and information and capacity building efforts (e.g. information campaigns, training, and support for research and development). Policy packages should also encourage the application of successful business models, involving utilities and attracting private sector finance, to drive energy efficiency investments in buildings.

United States

The United States Department of Energy, through the Building Energy Codes Program, participates in the process of developing model national codes and helps states to adopt and implement more efficient energy codes. ENERGY STAR and LEED are two voluntary programmes that have been successful. The Energy Independence and Security Act of 2007 calls for new construction to be net-zero energy (NZE) by 2030 and for all buildings to be NZE by 2050. The Net-Zero Energy Commercial Building Initiative aims to achieve marketable NZE buildings by 2025 through public and private partnerships. 25 states are currently implementing energy efficiency resource standards, which are long-term, binding energy savings targets for utilities or third-party administrators. California mandated new low- and mid-rise homes to be NZE by 2020 through its Building Energy Code. New York City announced in 2016 a suite of new energy efficiency initiatives for buildings, including a new building energy code and acceleration of deep retrofits, to put the city on a pathway to an 80% emissions reduction by 2050. The code will also require solar-ready zones on roofs and a performance-based accounting paradigm to measure whole-building energy performance. The city of Cambridge recently adopted a plan to have the entire city be NZE by 2040, where all GHG emissions produced must be offset by carbon-free energy production.

European Union

The European Union (EU) put in place a high level target to reduce energy consumption by 20% by 2020, in coordination with the EU's 20% renewable target and effort to reduce GHG emissions by 20%. Specific legislation (the Energy Efficiency directive and the Energy Performance of Buildings Directive) set requirements to increase the energy performance of buildings across Europe. All new buildings in Europe must be nearly zero energy by 2021 and all EU Member States are required to develop national renovation strategies every 3 years to provide an overview of national building stock and identify policies to stimulate cost-effective renovation. Related to this and to encourage existing public buildings to lead by example, 3% of floor area of central government buildings must be renovated every year. Energy Performance Certificates, which provide information to consumers on buildings they plan to purchase or rent, including an energy performance rating and recommendations for cost-effective improvements, are also obligatory in all EU Member States. In the coming months, the European Commission is expected to come forward with revised policies and targets for 2030.

China

China has building energy codes for commercial buildings as well as residential buildings in four climate zones, which are mandatory in urban areas and voluntary in rural areas. China also has a green building labelling system, under which buildings are rated from 1 to 3 stars according to a set of environmental criteria, including energy performance. Energy performance certificates are issued based on both design and post-occupancy energy efficiency. China also has obligations for energy-efficient renovation of existing buildings with the aim to bring their energy performance to the levels of new building energy codes. This scheme required after 2011 a 10%-15% reduction for commercial buildings (depending on size) by the end of 2015. In 2016, the 13th Five-Year Plan for Housing and Urban-Rural Development (for 2016-2020) set an overall aim to tighten energy efficiency of building standards and increase the share of energy-efficient buildings and technologies. By 2020, over 50% of new buildings are to comply with the standards, and the share of green construction materials is to exceed 40%. The stringency of energy efficiency standards is also set to increase by 20% in 2020 over 2015 levels.

Building Energy Codes

Building energy codes and standards are regulatory instruments that set minimum requirements for energy efficiency and/or use of resources in buildings (e.g. requirements for energy sufficiency and renewable energy sources). Currently, both mandatory and voluntary building energy codes exist in more than 60 countries worldwide.

Requirements in codes can be set for different elements of a building (prescriptive codes) or for the whole building (performance-based codes). There is a general trend towards performance-based codes or towards combinations of both performance and prescriptive requirements.

Buildings energy performance is usually determined on modelling assessments during the design stage. However, some jurisdictions have started to follow an outcome-based approach requiring a specified performance to be achieved and then verified during building operation over a certain period.

Building energy codes are critical for new construction given the long lifespan of buildings, especially in developing countries, where increasing population, urbanisation and economic development are driving rapid growth in floor area in both residential and non-residential buildings. It is also typically more costly to build an inefficient building and then perform efficiency retrofit measures.

Regulation for energy performance of existing buildings is also crucial, and more and more countries are including energy performance requirements in regulations for existing buildings. Without such requirements, there is a risk of locking-in potential energy savings when existing buildings undergo regular maintenance and refurbishment. Last, effective enforcement of codes, which can be ensured through compliance checks, incentives and other supporting instruments, is critical and remains an issue in a number of countries.

The examples listed here are non-exhaustive and illustrative of building energy codes from various regions.

California has a long history of building energy code development with a continuous increase in stringency and enforcement. California's building standards in 2016 (to be enforced as of 2017) set net-zero energy requirements for all new residential buildings by 2020, for new commercial buildings by 2030, for new state buildings and half of major retrofits by 2025, and for half of existing commercial buildings by 2030. The new standards include: a basic set of mandatory requirements for all buildings, a set of performance requirements that vary by building type and climate zone, and a set of prescriptive packages as an alternative to the performance-based approach.

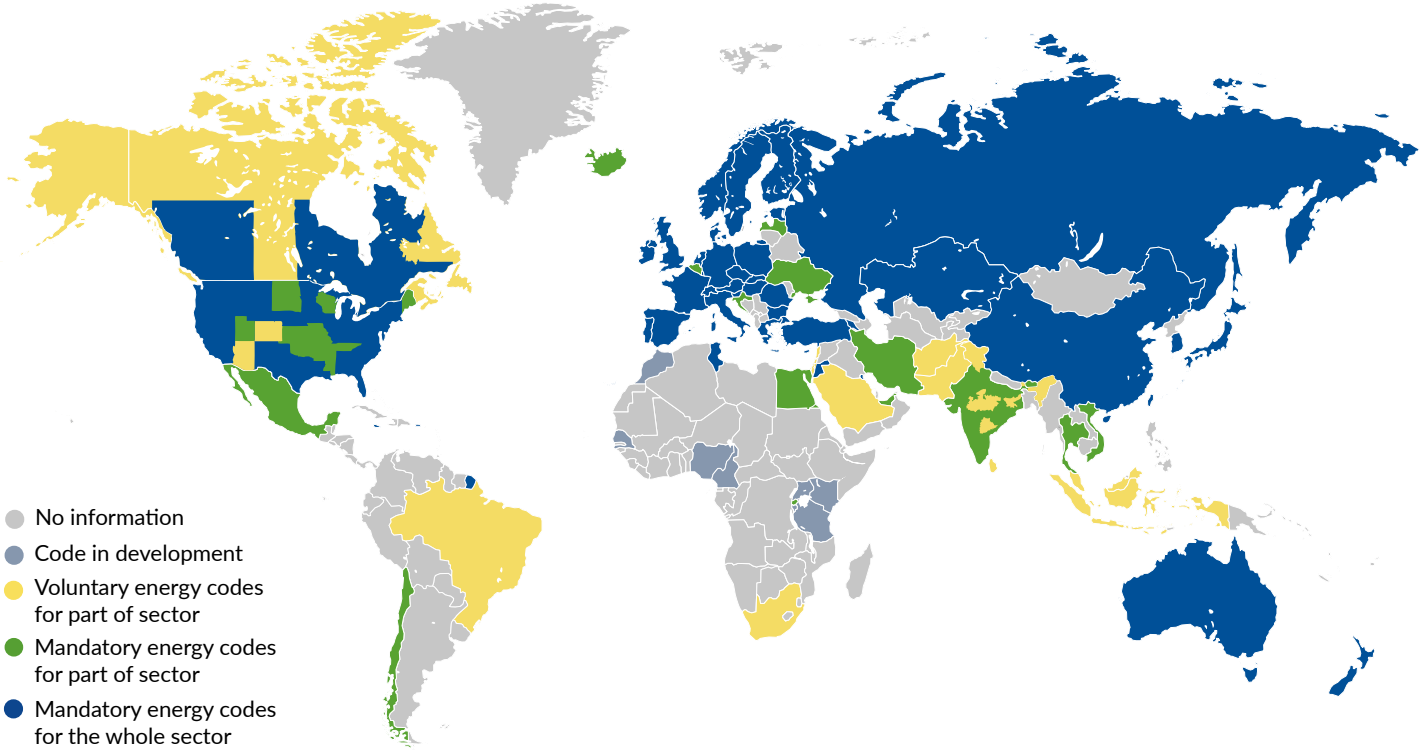
Morocco developed with the support of UNDP thermal regulations for buildings, which introduce minimum performance requirements in new residential and commercial buildings that optimise the need for heating and cooling while improving their thermal comfort. The implementation process of the regulation will start with development of additional decrees and technical specifications.

Ukraine considers the adoption of new government regulations and standards in the area of design and construction, bringing them closer to European Union requirements.

Kenya is planning to adopt the European standards (Eurocode), which cover structural design of buildings, sustainable use of natural resources and other civil engineering works comprising of geotechnical aspects and structural features.

Indonesia has developed national standards that are key components to the green building codes in the cities of Jakarta and Bandung. Both cities have mandatory requirements for large buildings, while Bandung, announced on 27 October 2016, that it also has green building code requirements for small buildings and incentives for sustainability.

Figure 8 **Building energy codes and standards, 2015**



This map is without prejudice to the status of or sovereignty over any territory, to the delimitation of international frontiers and boudaries, and to the name of any territory, city or area.

Armenia introduced in 2016 a mandatory building energy code with the adoption of a new regulation "Thermal Protection of Buildings", which was developed based on Russian Building Energy Code from 2003 (updated in 2012) and European codes and methodologies. It links building envelope construction and heat loses with established energy limits, taking into account differences in climatic conditions. It also includes a requirement for a building energy passport and an energy efficiency label with energy efficiency classes.

Japan adopted the Act for the Improvement of the Energy Consumption Performance of Buildings in 2015, which will be fully enacted in 2017. It introduces energy efficiency standards for new large buildings (2 000 m^2 or more) and will expand the coverage to smaller-sized commercial and residential buildings by 2020. Building developers are also obliged to report plans for the design or refurbishment of residential and non-residential buildings with floor space above 300 m^2.

Flanders, a region in **Belgium**, has implemented a long-term roadmap of minimum energy performance standards for new residential buildings to guide the market towards all new buildings being nearly-zero energy building by 2021. The standards are strengthened regularly, allowing building owners and investors to plan ahead, and severe compliance controls are in place to enforce the standards. The standards are also combined with subsidies, encouraging performance that is higher than the minimum energy standard.

India has continued progress in shifting from a voluntary national code to locally adopted mandatory code in most states across India. This is enabling consistency across the market while also increasing the energy efficiency of buildings.

Building Energy Certification

The success of building energy certification (also referred to as energy rating or energy labelling schemes) lies with the market value of "green" features in buildings[21]. This is translated into an increased penetration of energy-efficient buildings through demonstration of best practices and by "pulling" the market.

The idea of building energy certification is similar to building energy codes, and they are often linked and/or introduced together to increase efficiency potential. While building energy codes define minimum energy performance requirements, certification enables recognition of higher performance.

Building energy certification policies vary across countries. They can include a singular certification (e.g. PassivHaus) or can be combined with a label (e.g. Green Pyramid Rating System in Egypt) and even with a mandatory display (e.g. European Energy Performance Certification). Certification programmes can include comparison labels that categorise buildings into classes (e.g. European Union energy performance labels or LOTUS in Viet Nam) or endorsement labels, which function as a 'seal of approval' (e.g. ENERGY STAR).

Disclosure of energy labels helps building owners, users and retailers to learn about the energy consumption of buildings. They aid purchase decisions when they are disclosed at the time of sale or renting of a building[22] and can help decision-making for renovation and construction (World Bank, 2015).

As of 2016, there are almost 40 countries with mandatory certification programmes (some are still at the legislation stage). Voluntary certification programmes are even more widespread, with over 80 countries using systems including LEED, BREEAM and others[23].

Building energy performance certification programmes that were developed in the past should be carefully examined from the perspective of carbon lock-in potential to reflect recent climate ambitions[24].

The examples provided here are illustrative of certification measures deployed in various regions, but do not represent all systems being applied globally.

21 *Erskine and Collins (1997), Eco-labelling: success or failure?, Environmentalist, Vol. 17, Issue 2. June.*

22 *Becqué et al. (2016), Accelerating Building Efficiency: Eight Actions for Urban Leaders, WRI, Washington D.C.*

23 *IEA (2016), Policies and Measures Database.*

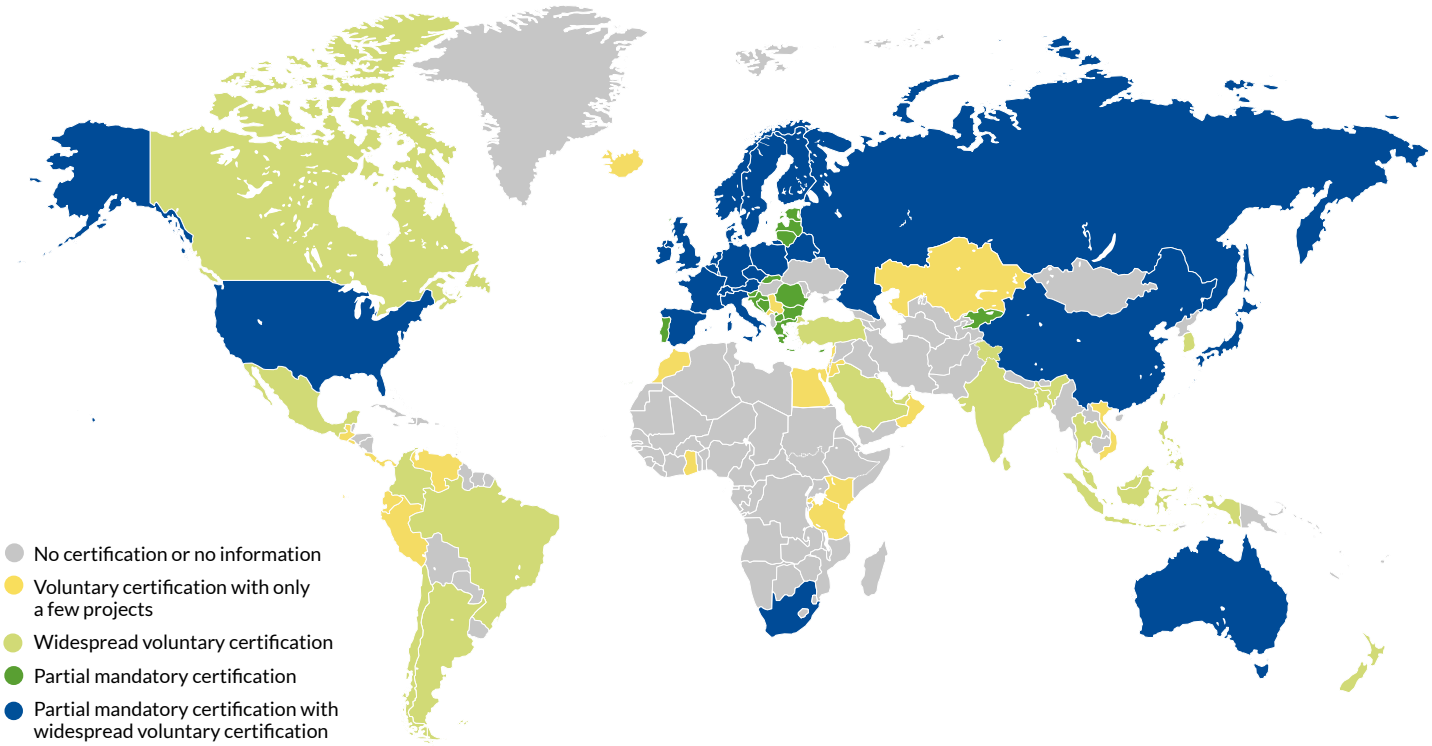
24 *Boza-Kiss et al. (2013), Evaluating policy instruments to foster energy efficiency for the sustainable transformation of buildings, Environmental Sustainability, Vol. 5, Issue 2, June.*

Russia adopted decree 399 in August 2016, which sets the rules for energy efficiency classes of apartment buildings. The energy efficiency class is determined based on comparison of the actual energy use (for existing buildings) and estimated energy use (for new buildings), with the base energy use value setdepending on the heating degree-days and the building height. The certification includes nine classes (A++ to G) and requires the building class to be presented in the energy passport and on the building façade. The A++ class presumes 60% energy savings in comparison to the base level. High energy efficiency classes cannot be given to a building that is not equipped with: an individual heat-supply station with automatic indoor temperature regulation, energy-efficient lighting of common areas and energy meters in each apartment. This certification system is envisioned to be mandatory; however, it is not yet enforced, and measures to stimulate compliance have not been developed yet.

Australia has multiple rating systems that include energy efficiency for buildings, including NABERS and NatHERS, administered by the government, as well as Green Star, which is administered by the Australian Green Building Council. NABERS rates residential and non-residential buildings on the scale from 0 to 6 stars, with 6 stars representing exceptional GHG performance and resource efficiency. NatHERS rates the energy efficiency level, based on building design and the predicted thermal performance of planned residential buildings and for major extensions, assigning a score of 0 to 10 stars. The Commercial Building Disclosure Program also mandates the disclosure of energy efficiency information for commercial office spaces. From July 2017, the minimum floor area threshold for eligible buildings will reduce from 2 000 to 1 000 m2.

The **International Finance Corporation** developed the EDGE (Excellence in Design for Greater Efficiencies) system to provide building and construction stakeholders in developing countries a simple and affordable means to quantify a building's energy and water efficiency. Designers using EDGE are presented with green options relevant to local contexts, allowing them to optimize a building's performance. With the EDGE software, users can develop designs meeting the EDGE standard of 20 percent efficiency in energy and water consumption, as well as embodied energy in materials, and determine any additional investment needs. IFC has seen strong market uptake with almost a million square meters certified and the adoption of EDGE as a green asset definition for green bonds and financial intermediaries in India, South Africa, Turkey, and Costa Rica.

Figure 9 **Building energy certification, 2015**



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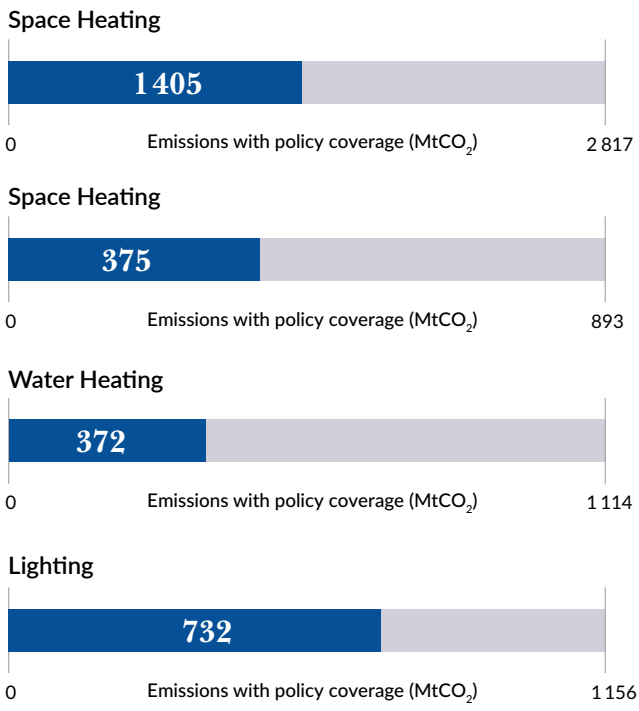
Singapore launched a voluntary building certification – Green Mark – in 2006. It provides an environmental rating of buildings based on a number of criteria, including energy efficiency. New and retrofitted buildings with a gross floor area above 5 000 m2 that achieve ratings of Green Mark Gold or above can benefit from monetary incentives.

The Green Mark was used as the basis for Singapore's mandatory building energy code (the 2008 Building Control Act). It was revised in 2013 and came into force in January 2014, introducing the requirement for existing buildings to comply with the minimum environmental sustainability standard (Green Mark Standard), submit energy efficiency audits of cooling systems periodically, and provide information on energy consumption. In 2015, the Green Mark was introduced to improve further the environmental sustainability of building envelopes.

South Africa set a new policy, SANS 1544, to audit and provide an energy performance certificate for all government buildings every three years. This policy included capacity building of a new auditor industry with 2 000 planned new auditors. Private sector buildings are not required to get certification; however, the expanded auditor industry and the Green Star programme, administered by the South Africa Green Building Council, is enabling more voluntary certifications.

»KEY SUSTAINABLE BUILDING TECHNOLOGY SOLUTIONS

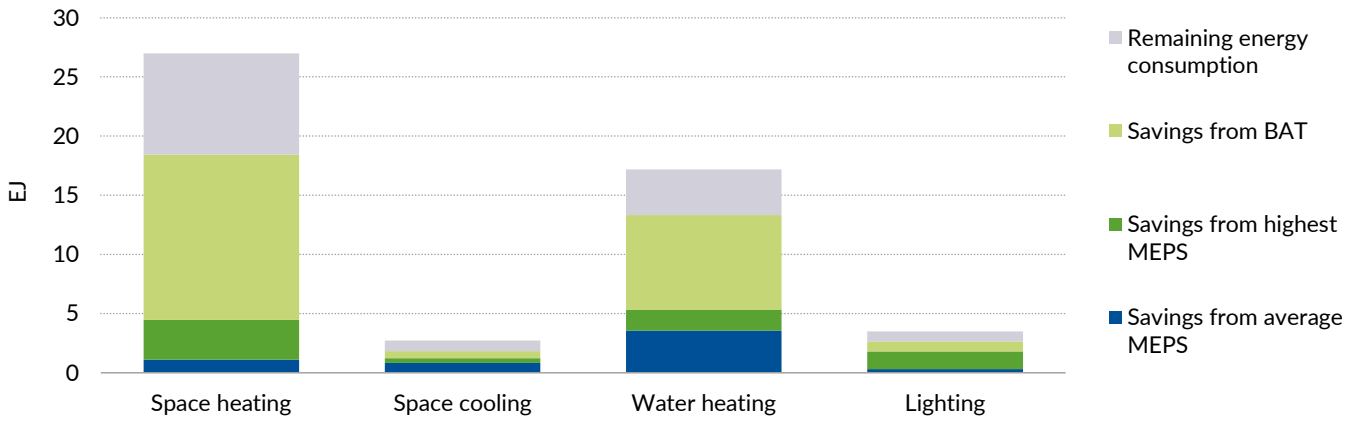


Two-thirds of global building energy use is still not subject to minimum energy performance standards (MEPS)[25]. Globally, the energy savings potential in 2015 would have been of the order of 6 EJ (1.67 x 106 GWh), or 6% of global residential energy consumption, had average standards been implemented across all countries for space cooling, space heating, water heating and lighting. Implementing the highest current minimum energy performance standards globally would have saved 13 EJ (3.6 x 106 GWh), or nearly 15% of global residential energy consumption. If best available technology (BAT) had been installed globally, the savings would have result in savings of more than two-thirds.

Key point

Existing technologies can save more than two-thirds of major end-use energy consumption in buildings.

Figure 10 **Energy savings in 2015 if all installed stock had met minimum energy performance standards**



Note: Estimates do not take into account product lifetimes or saturation rates in the energy savings potential.
Source: IEA (2016), Energy Efficiency Market Report 2016.

25 *IEA (2016) Energy Efficiency Market Report 2016, IEA/OECD, Paris.*

Table **IEA recommendations on global building technology policy**[26]

Policy action area	*Near-term action (through 2025)*	*Long-term objective (2025 to 2050)*
Whole building systems	Enforce building energy codes in all regions and strive for near zero-energy buildings (nZEBs) in new construction. Implement policies to drive uptake in deep energy renovation in existing buildings.	Develop advanced building energy codes in all regions with high energy performance standards (e.g. nZEBs or better) for all new construction and low-energy targets for existing buildings.
Building envelope	Promote very high performance envelopes, including air sealing, insulation, highly insulating windows and cool roofs. Include requirements for building envelopes in mandatory building energy codes.	Achieve highly insulated, integrated building envelopes (e.g. nZEBs or better) at negative life-cycle cost. Mandate minimum energy performance for building envelope components through enforceable building energy codes[27].
Space heating and cooling equipment	Increase promotion of solar thermal and heat-pump technology. Prohibit the use of electric resistance heaters as main heating source in buildings. Mandate minimum performance standards above 120% efficiency for heating equipment and above 350% for cooling equipment.	Achieve integrated energy solutions for heating and cooling with net-zero emissions. Pursue low-cost solar cooling technologies. Mandate minimum performance standards above 150% efficiency for heating equipment and above 400% for cooling equipment.
Water heating	Encourage uptake of heat-pump water heaters or instantaneous systems. Continue R&D on low-cost solar thermal systems.	Mandate minimum performance standards < 150% efficiency for electric equipment. Achieve solar thermal systems that meet ≥ 75% annual water heating load.
Lighting	Ban all traditional incandescent and halogen light bulbs. Continue R&D and promotion of solid state lighting (SSL) and other innovative designs.	Implement minimum lighting energy performance criteria above 100 lumens/ watt.
Appliances and cooking	Mandate minimum energy performance standards for appliances and equipment to achieve clean, energy-efficient cooking solutions.	Bring to market highly efficient appliance technologies and mandate minimum energy performance standards for all electric plug-loads.

26 Adapted from IEA (2016), Energy Technology Perspectives 2016, IEA/OECD, Paris.
27 For more information on building envelope technologies, R&D and energy performance targets, see www.iea.org/publications/freepublications/publication/technology-roadmap-energy-efficient-building-envelopes.html.

Figure 11 **Energy efficient technologies and trends**

USA, Los Altos | e+ Office

David and Lucile Packard Foundation

High Performance Envelope: The design team selected triple-paned windows in order to reduce the thermal bridges throughout the envelope.

Climate Responsive Cooling: A cooling tower provides chilled water to a storage tank that is passively cooled during the night. The water is circulated throughout the building to chilled beam exchangers.

Daylighting: By configuring two narrow office wings around a central courtyard the design team maximized the building's daylighting potential.

France, Paris

Energy positive social housing

© Luc Boegly

© Vandemusser Design

Single Family House
North Carolina, USA

Israel, Ramat-Gan

NZEB Residential / ***Team Israel***

Building-integrated photovoltaics designed for climate control and vertical solar harvesting. Designed to maximise entry of indirect natural sunlight.

© William SheHall

Leon County Extension / Florida, USA

© United Nations Environment Programme

UN Environment
Headquarters / Nairobi, Kenya

Brazil, San Paulo | NZEB-Stadium

Estádio Nacional

Stadium includes strip of solar panels encircling the roof, which is semitransparent, allowing natural light to filter through to reduce lighting costs.

© Crossways Farm Village

House Rhino / South Africa

Denmark, Solhuset | e+ School

Solhuset (The Sun House)

Building Design: Shape, orientation and windows are optimised in relation to the plot and the sun to make maximum use of daylight and solar heat throughout the day and year.

Renewable Energy: A combined solar and geo-thermal system provides the necessary energy for space heating and hot water while solar cells convert solar energy into electricity.

China, Shanghai | e+ Residential

Passive Design: Strict design of thermal insulation performance, and an outside facade for increased shading coefficient.

Energy System: The energy system includes a solar collector system, the HVAC&DHW system, an indoor terminal unit (heat recovery ventilator) and the renewable energy power system.

India, New Delhi | NZEB Office

Indira Paryavaran Bhavan

Solar passive design: The design reduces heat ingress in building envelope and allows for 75 % of natural daylight to be utilised to reduce energy consumption.

HVAC: Energy-efficient chilled beam system of air-conditioning and geothermal heat rejection for the cooling towers of HVAC system.

Renewable Energy: On site solar photovoltaic cells to meet total energy demand

Two stall office building

© University of Wollongong

Illawarra Flame / Australia

Réunion

Bioclimatic amphitheatre in Moufia

© Hervé Douris

Key point

Net-zero energy and energy-positive buildings are applicable in various locations, climate zones and building types, often at low additional costs and demonstrating high levels of building energy performance through energy efficiency measures and integration of renewable energy supply.

» INVESTMENT AND FINANCE TO ENABLE TRANSFORMATION

Total spending on energy-efficient products and services in buildings was USD 388 billion[28]. Incremental energy efficiency investments in buildings, including appliances and lighting was USD 118 billion in 2015. This is less than 8.5% of the USD 4.6 trillion spent on construction and renovations of new and existing buildings globally. The building envelope, primarily with insulation and windows, accounts for the largest share of investments in building energy efficiency at USD 237 billion.

Overall, there is increasing evidence that points to the positive links between a buildings sustainability and financial performance. For instance, a study commissioned by ClimateWorks Foundation on the role of energy efficiency in reducing abatement cost to achieve a below 2°C target at global level showed that cumulative energy savings of USD 2.5 to 2.8 trillion (constant 2005) could be achieved by 2030[29].

Yet, to date, sustainability data, such as building energy efficiency performance, remain insufficiently considered in risk assessments and for resulting investment decisions. A crucial reason for this is that existing data on sustainability performance is often not considered as a reliable and accurate proxy for a building's actual performance. Current regulatory and voluntary standards, labels and third party verification also do not typically provide enough indication on the underlying information's reliability.

The resulting uncertainty of currently available data cannot create the chain of trust that is needed for investments and loans to be directed at the sustainable and energy-efficient buildings and construction market. An improved investment process with reliable, trusted tools to assess building sustainability is needed and should include collaboration with the end-users of this process (e.g. risk managers) to increase the availability, transparency and quality of the data through a qualitative assessment on the extent to which the data captures the actual building performance.

Once quality information on building performance and investments is made available, it can be connected to financial analysis, evaluation and risk assessment methods to enhance the systematic integration of sustainability indicators into real estate financing decisions in the investment, banking and insurance industries. Over time, this improved process will lead to higher levels of data availability, data quality and improved confidence in relation to both the financial and energy performances of building investments.

Defining, deploying and implementing a robust policy framework to encourage energy efficiency deployment and investments in low-carbon buildings are essential. Sound policy frameworks need sound baseline data, strong understanding of the construction value chain, specific technical instruments (e.g. standards on construction materials, testing & certification, etc.) and training of multiple actors, from architects to construction workers. All of these come with a cost.

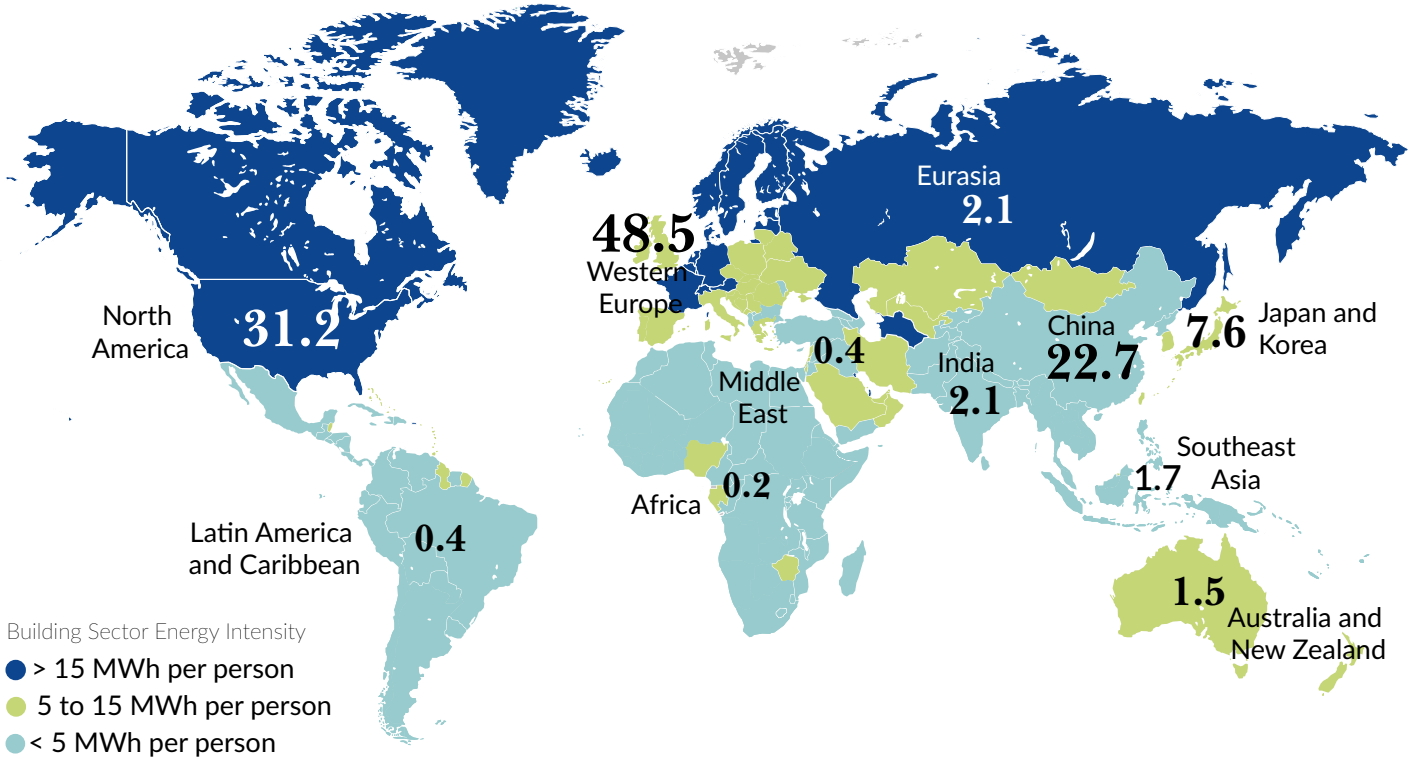
Technical assistance is essential to support capacity building, and global funds are ideally positioned to provide the funding for energy efficiency needed to transform the buildings and construction sector. Increased funding for energy efficiency in buildings and to enable tracking on global progress are also needed.

To accelerate investment in energy efficiency in the building sector, the Environmental Defense Fund and the Green Business Certification Inc. recently set a strategic vision to develop, deliver and promote the Investor Confidence Project[30] as the premier global underwriting standard for energy efficiency projects.

Building on an existing body of empirical evidence regarding the link between a building´s environmental performance levels and financial performance and on available professional guidance, the RenoValue

28 IEA (2016) Energy Efficiency Market Report 2016, IEA/OECD, Paris.
29 Fraunhofer (2015), How Energy Efficiency Cuts Costs for a 2-Degree Future, Karlsruhe, Germany.
30 www.eeperformance.org

Figure 12 **Energy efficiency investment by region, 2015 (USD Billion)**



This map is without prejudice to the status of or sovereignty over any territory, to the delimitation of international frontiers and boudaries, and to the name of any territory, city or area.

consortium[31] has developed dedicated capacity building material for real estate assessors on how to reflect energy efficiency and renewable energy features within valuation reports to raise awareness and demand amongst their clients. Originally funded by the Intelligent Energy Europe Programme and covering seven EU member states, the consortium is now rolling out the training a globally through strategic partnerships, starting with adaptation of the material in Australia.

The International Partnership for Energy Efficiency Cooperation (IPEEC) Energy Efficiency Finance Task Group has also developed Voluntary Energy Efficiency Investment Principles[32] that provide a high-level framework for enabling policies that are essential for enhancing capital flow to energy efficiency investments. These principles were welcomed by energy ministers and are embedded in the 2016 G20 Energy Efficiency Leading Program.

To date, investors with a cumulative USD 4 trillion under management have signed the G20 Energy Efficiency Investor Statement, recognising the need to fully embed energy efficiency into their investment process. 117 banks have also signed the Statement by Financial Institutions on Energy Efficiency, thereby pledging to work towards increasing energy efficiency financing.

31 www.renovalue.eu
32 IPEEC (2016), Voluntary Energy Efficiency Investment Principles for G20 participating countries, Paris.

» PATHWAYS TO SUSTAINABLE BUILDINGS

Building sector energy demand is expected to increase by 50% by 2050[33]. Even with announced policy measures to increase the energy efficiency across end-use technologies (e.g. heating and cooling equipment, lighting and appliances), global building energy consumption is still expected to grow to nearly 160 EJ (44.4 x 106 GWh) in 2050 (30% higher than 2013).

There is no below 2°C scenario without a full mobilisation of low-carbon action in the building and construction sector. Effective action to improve building energy efficiency is needed to limit building energy demand to 2013 levels.

There are opportunities to bring buildings and construction on a low-carbon pathway in every economy, particularly through:

- Improved adoption and enforcement of building energy codes for new building construction are critical to curb space heating and cooling energy demand growth, especially in developing countries and emerging economies.
- Assertive measures to address the energy performance of existing buildings will be critical to achieve below 2°C ambitions, especially in developed countries.

Under a 2°C trajectory or below, global energy savings in the building sector would reach 55 EJ (15.3 x 106 GWh) in 2050, equivalent to the total final energy consumption for nearly all of Africa, the Middle East and Latin America in 2014. Those savings would lead to an 85% reduction in total global building energy-related CO_2 emissions in 2050 – or a potential cumulative savings of 84 gigatonnes of CO_2 ($GtCO_2$) from energy efficiency, fuel switching and renewable measures in buildings. When paired with increased investments in low-carbon power generation, those cumulative saving are nearly 250 $GtCO_2$.

Energy efficiency measures in the building sector will play a key role in supporting carbon abatement in the power sector, representing more than one-third of the total[34] CO_2 emissions reduction to 2050 related to the global building sector. Those energy efficiency improvements also play a vital role in reducing capacity and investment needs in power generation[35].

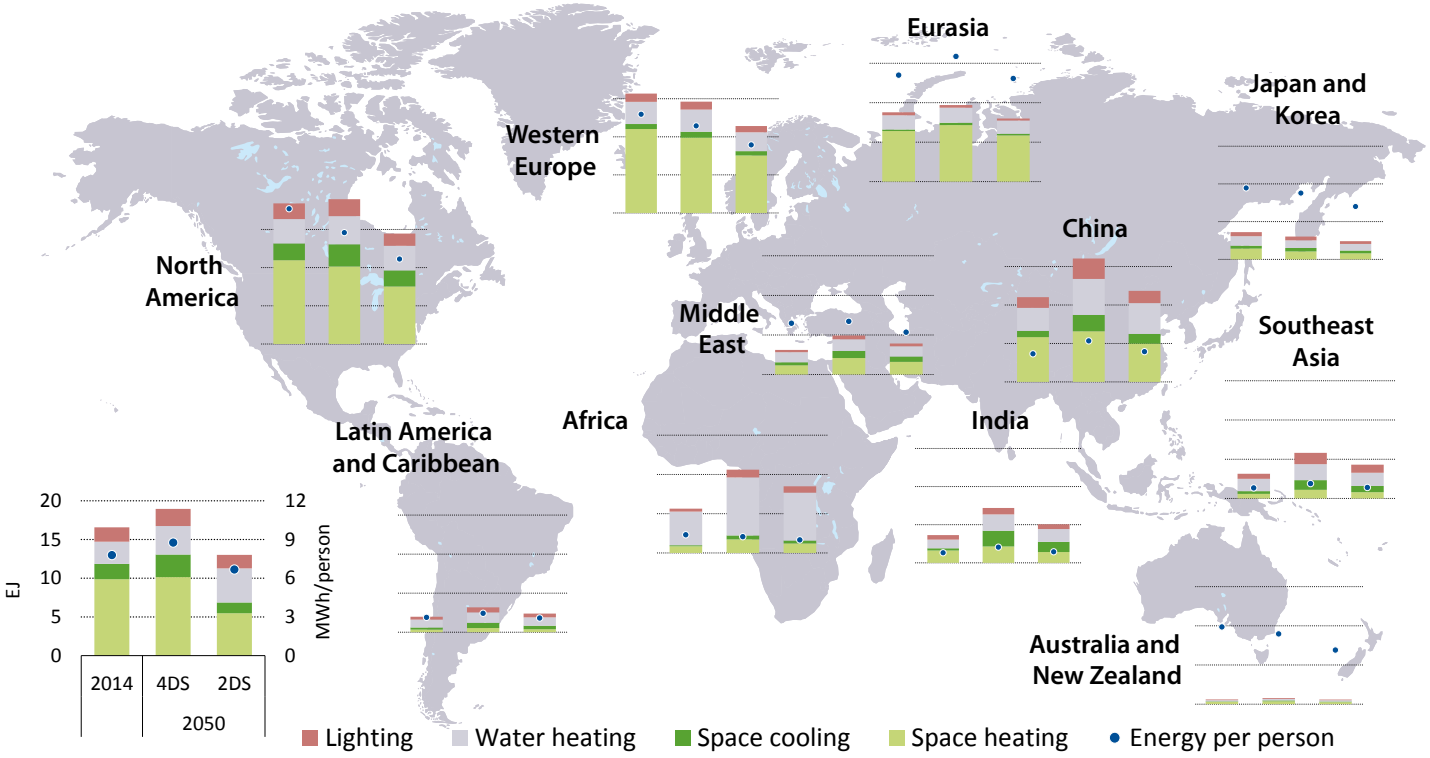
Capturing the enormous energy and emissions saving potential in the global building sector would deliver a broad range of benefits, including lower electricity and fuel costs for businesses and households, greater reliability in meeting energy demand without costly infrastructure and vulnerability to grid disruptions, and reductions in GHG emissions and other pollutants that pose a threat to human health.

84 $GtCO_2$

Cumulative global emissions savings potential in the global building sector from measures in buildings.

33 IEA (2016), Energy Technology Perspectives 2016, IEA/OECD, Paris.
34 This includes direct emissions as well as indirect emissions from power generation for electricity and commercial heat consumption in the building sector.
35 IEA (2016), Energy Technology Perspectives 2016, IEA/OECD, Paris.

Figure 14 **Global building sector final energy consumption (EJ) and energy intensity per person (MWh/person) by carbon scenario**



This map is without prejudice to the status of or sovereignty over any territory, to the delimitation of international frontiers and boudaries, and to the name of any territory, city or area.

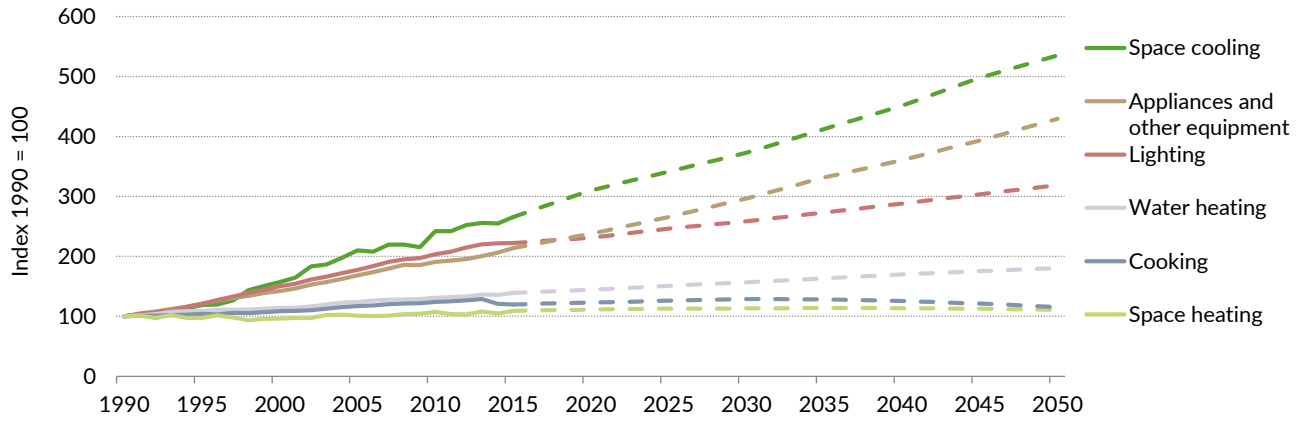
Note: Final energy demand represents energy consumption for space heating, water heating, space cooling and lighting in buildings. It does not include cooking, appliances or other building energy services. The 4°C scenario (4DS) represents a global energy and emissions trajectory that takes into account recent pledges by countries to limit emissions and improve energy efficiency, which help to limit average global temperature rise to below 4°C. The 2°C scenario (2DS) lays out an energy systems deployment pathway and emissions trajectory that is consistent with a 50% change of limiting average global temperature increase to 2°C.

Source: IEA (2016), Energy Technology Perspectives 2016, www.iea.org/etp.

Key point

Global building energy use is expected to increase by another 30% over 2013 levels, despite announced policy measures to increase energy efficiency in buildings. Assertive action is needed to address the energy performance of both new and existing buildings as well as the efficiency of energy-consuming equipment.

Figure 15 **Global buildings sector end-use energy consumption, 1990-2050**



Note: Index represents change in final energy demand for building sector end-uses.

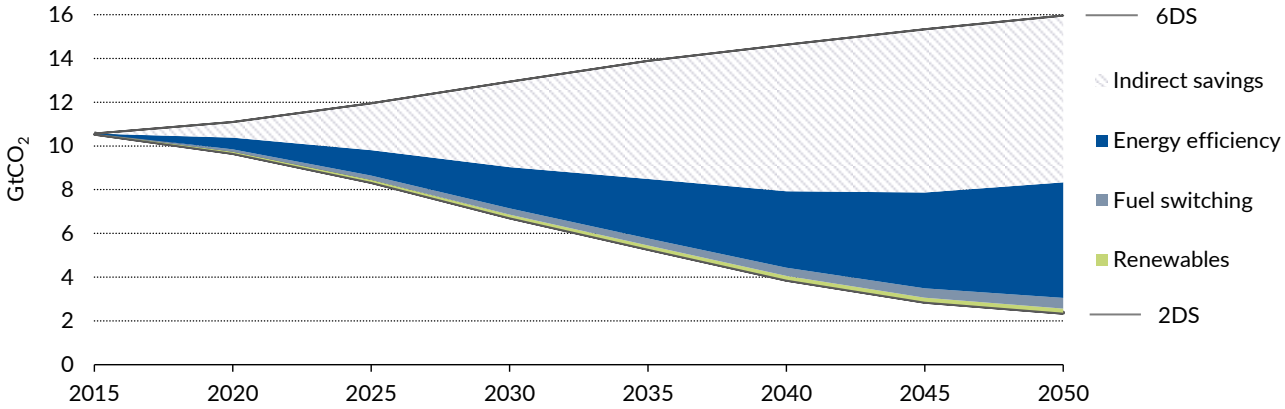
Key point

Space cooling has been and will continue to be the fastest growing building end-use to 2050.

To achieve this important ambition, policy action is needed to promote building energy efficiency measures and to ensure that they are standard practice across the global building market.

Governments need to work together and with key stakeholders to ensure that manufacturers, building designers, constructors, owners and occupants all maximise energy efficiency potential and limit the costs of future change by taking action today, particularly as most buildings and many building technologies have long lives. This is especially true in rapidly emerging economies, where there is a window of opportunity to ensure construction of high-efficiency new buildings over the coming decades. Significant effort is also needed now to promote deep energy renovations of existing buildings, especially as it may take ten to 15 years in some markets to ensure that deep energy renovation measures are viable, cost-effective and standard practice.

Figure 16 **Global building sector emissions saving potential to 2050**



Note: Indirect savings represent CO_2 emissions reduction from power generation for electricity and commercial heat in the building sector.
Source: IEA (2016), Energy Technology Perspectives 2016, www.iea.org/etp.

Key point

The global building sector has enormous potential to reduce energy-related GHG emissions, especially through energy efficiency measures that will support decarbonisation of the power sector.

»KEY FINDINGS

This Global Status Report reconfirms the significance of building energy consumption as a contributor to global GHGs. It also shows that efforts to decarbonise the building sector through the implementation of comprehensive policy frameworks and the deployment of existing energy-efficient technologies and building design approaches can deliver positive economic, social, health and environmental benefits.

The effective implementation of building energy policies, technologies and efficient building designs and renovations relies on reliability and accessible data as a basis for decision-making, technical-professional capability and increasing the level of awareness and demand for energy-efficient and low-carbon buildings.

Some progress is being made, however the pace and scale of actions does not match the need nor urgency of the challenge. To realize the potential of the sector requires policy, technology and finance measures which will accelerate efforts in all regions.

1. Increased deployment of building energy **codes and policies,** along with increased use of energy-efficient technologies, has helped to offset increases in total building energy consumption since 1990, despite the huge increase in the global built area. However, global building energy consumption per capita has remained practically unchanged in that period. This requires further effort in policies that spur technology improvements as well as behavioural changes of building owners and users.

2. Harnessing the energy savings and GHG mitigation potential of the building sector is recognised as essential to achieving and exceeding the climate goals of **NDCs** and non-state actors. 88 countries to date have recognised the role of the building and construction sector in their INDCs. Although, this still represents only about half of all nations.

The NDCs provide a unique opportunity for countries to set actions and targets for improvement of energy efficiency in the building sector. Governments should ensure these actions and targets are reflected in national policies.

More needs to be done to encourage all countries to engage the building and construction sector in implementing NDCs.

3. **Investment** in energy-efficient buildings is increasing rapidly, but to scale up funding, more needs to be done to further strengthen the existing evidence base of building energy performance and return on investments. More systematic capture and management of quality data is necessary to give investors the needed confidence to double current levels of investment by 2030 and to bridge the investment gap necessary to achieve a below 2°C target.

This Global Status Report identifies the necessity for global funds, such as the Green Climate Fund and development banks, to increase funding for quality, high-impact projects. Financing for capacity building and market development is also needed to move an efficient, low-carbon buildings and construction market forward.

4. Actors beyond national governments have a critical role to play, in partnership or concertation with the former. **Many cities and businesses** are already committed to achieving ambitious building energy and climate goals. More can be done to facilitate the engagement of the public and private sectors in local markets to develop market transformation action plans that support NDCs.

5. In addition to energy efficiency, it is critical to incorporate renewable energy and the **full array of climate mitigation and adaptation strategies** in building policies and commitments.

6. We have a **unique window of opportunity.** Given the fast pace of urbanisation and the longevity of buildings, failing to address building energy use, or setting only moderate energy and climate mitigation goals, will lead to a lock-in of higher-than-necessary energy demand and emissions from buildings and construction. This also risks locking in poor access to energy services and sustainable energy, which in turn undermines the achievement of sustainable development goals.

The next stage for countries, relevant local authorities and non-state actors is to fully detail a **roadmap** that engages the building sector in achieving and exceeding climate goals communicated in their NDCs. A number of supporting actions have been identified in this report that are needed to enable implementation pathways and roadmaps to sustainable buildings and construction that contribute to meeting the below 2°C target. These are:

1. Subscribe to a common Global Roadmap paving the way for transition towards low-energy, low- GHG and resilient buildings in line with the well below 2°C target, while also framing and/or facilitating the collaboration of countries and non-state actors of the building sector.

2. Develop and implement comprehensive policy-packages, involving all stakeholders, that incorporate ambitious energy performance requirements in building codes, together with complimentary incentive measures and voluntary programs that drive demand and build the capacity to deliver near- or net-zero energy in new buildings or at a system level in a cost-effective manner, and increase demand for deep energy retrofitting of existing buildings.

3. Increase finance and funding available to jurisdictions engaging in transformative building sector climate actions, notably for capacity building and technical assistance, such as those noted Pathway to Sustainable Buildings highlighted in this report, through international climate finance incentives, regulations and mechanisms such as the Green Climate Fund and development banks.

4. Mainstream sustainable building education & training. Curriculum for sustainability and/or energy efficiency is more frequently offered in professional degrees and building trade education. However, the impact of this curriculum on professional or trade practices is not always evident in building and construction activity. Sustainable building education and training must be structured as a life-long learning and should be required in continuing professional development programmes. The UN Environment Policy Guide to Sustainable Building Education provides policy and learning strategies for both formal and informal education.

5. Build an evidence base. There is no shortage of information and knowledge published on- and offline by researchers and practitioners regarding building energy and climate policy and goals. However, despite the significant body of research findings demonstrating positive impacts of sustainable performance, the quality of information or data on the performance of buildings needs to be standardised. Improving transparency in the measurement, reporting and verification of the impact of policies and other climate actions is necessary to support investors and financiers. Currently, the evidence base in the built environment is diffused and not specifically targeted to key stakeholder groups. This must be addressed.

6. Track contributions made by the building sector to keep global warming well below 2°C. Building sector progress toward achieving its significant energy and CO_2 mitigation potential is critical to monitoring global progress toward keeping global warming well below 2°C. In this regard, the indicators set out in this Global Status Report and in the Global Roadmap are a base for discussion to design a reporting framework by countries and relevant non-state actors, which should be monitored and communicated through subsequent Global Status Reports.

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GLOBAL ROADMAP

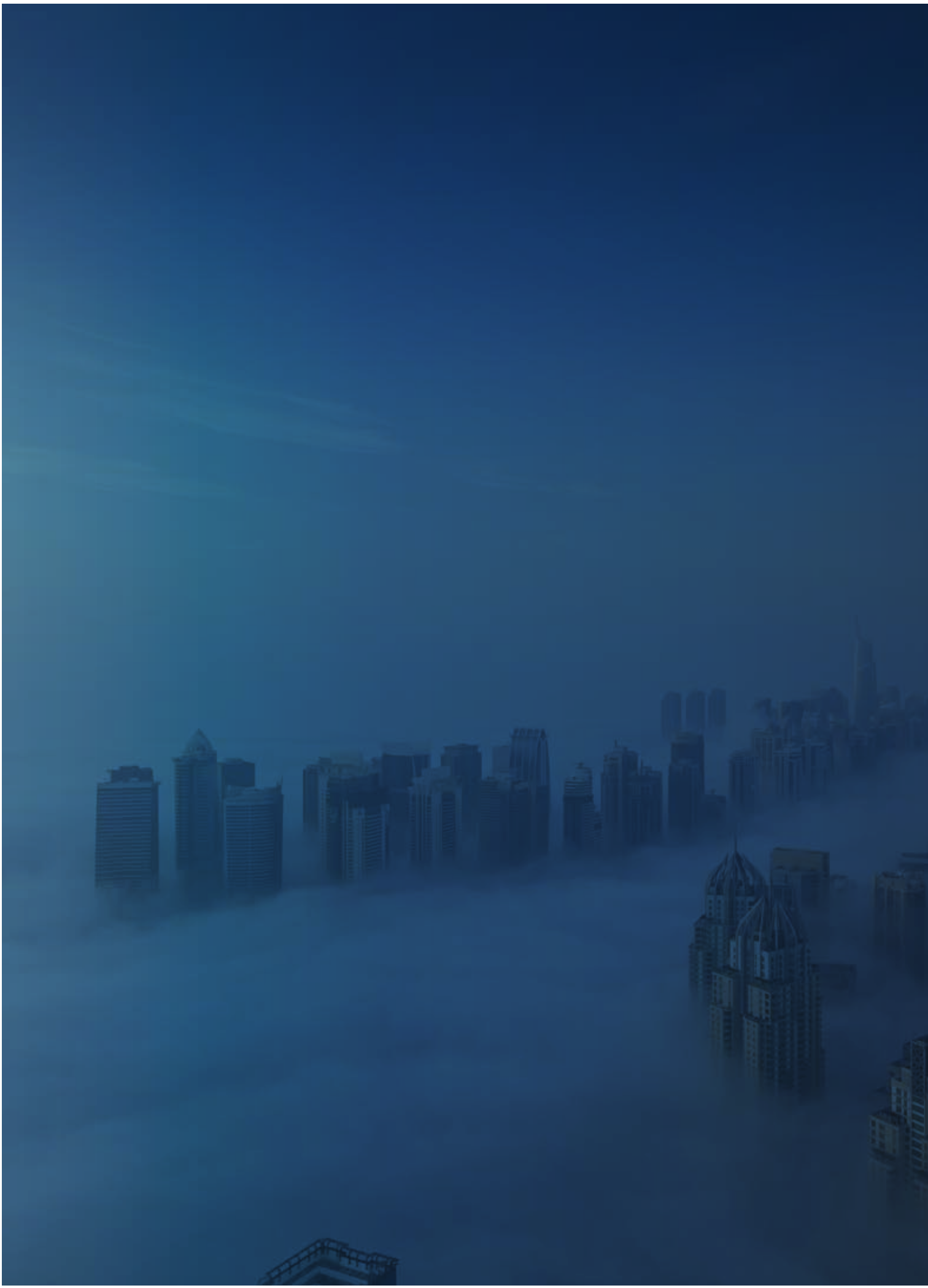
TOWARDS LOW-GHG AND RESILIENT BUILDINGS




"This Roadmap aims to describe, when possible, the main overarching goals, steps and agenda that the Building sector as a whole could share, creating the framework of a common vision for low GHG and resilient global real estate pathways"

Global Alliance for Buildings and Construction

November 2016



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INTRODUCTION

Energy use in buildings represents roughly one-third of global final energy consumption and accounts for nearly 20%[1] of the greenhouse gases (GHG) emissions worldwide[2]. Growing population, as well as rapid growth in purchasing power in emerging economies and many developing countries, means that energy demand in buildings could increase by 50% by 2050 (IEA, 2016). Construction of new buildings will also drive energy demand and buildings-related emissions, with global floor area in buildings expected to double to more than 415 billion square metres (m^2) by 2050 (IEA).

The responsibility of the building sector

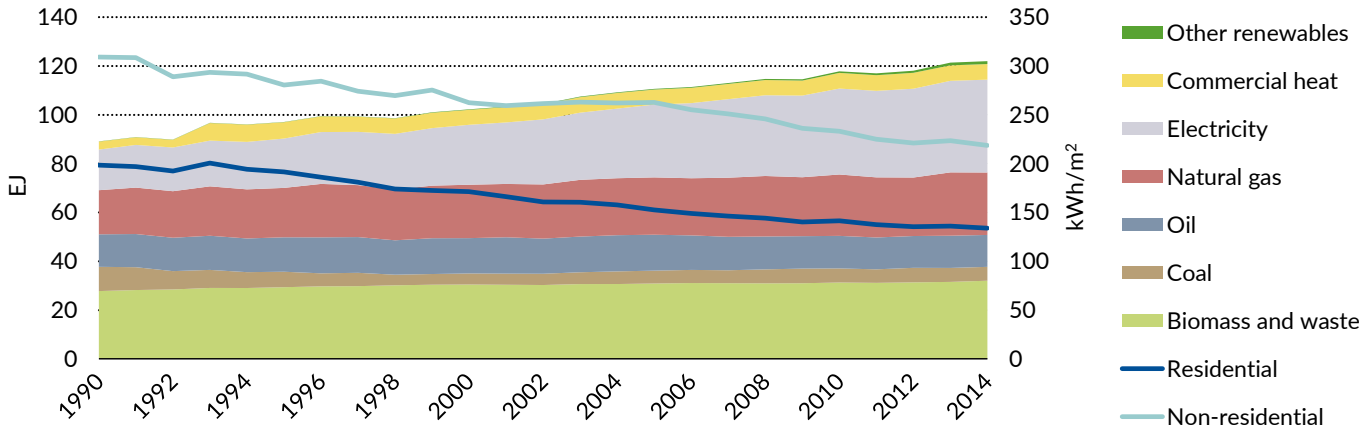
Nearly 20%

of global GHG emissions are buildings-related (Scope 1,2,3).

1 *This figure is a proxy: 33% (building contribution to energy consumption) of 56% (CO_2 energy part into GHG global emissions).*

2 *This data covers more than building-related energy (which is defined in Scope 1, 2 and 3). This concept will be further explained in the Roadmap (see page 6).*

Figure 1 **Global building sector energy consumption and intensity by sub-sector, 1990-2014**



Note: building sector energy consumption and intensities represent final energy consumption.

Source: IEA, calculations derived from IEA World Energy Statistics and Balances 2016, www.iea.org/statistics.

Buildings will also be particularly affected by the effects of climate change: storms, flooding and seepages, reduced durability of some building materials and increased risk of structure damage or collapse (e.g. from severe storms) could all decrease building lifetime, while increasing health-related risks such as deteriorating indoor climate.

2015 was a pivotal year in addressing climate change, with the adoption of the Sendai Framework for Disaster Risk Reduction[3], the 2030 Agenda for Sustainable Development[4] and the Paris Agreement at COP21. Now, in order for countries to successfully implement these agendas and reach their goals, it is crucial that important changes are made in the buildings and construction sector.

The Paris Agreement sets milestones for decarbonizing our society. It aims at "holding the increase in the global average temperature to well below 2°C above pre-industrial levels and to pursue efforts to limit the temperature increase to 1.5 °C above pre-industrial levels" (Art. 2 para 1a). It sets a long- term target on mitigation, by stating that "Parties aim to reach global peaking of GHG emissions as soon as possible" and to be carbon neutral in the second half of this century (Art. 4, para 1). Moreover, it decides that in 2018 Parties will take stock of the progress made towards this long-term goal, will undertake the first global stock take in 2023 and every five years thereafter (Art. 14 para 2), and will communicate a nationally determined contribution (NDC) every five years (Art. 4 para 9).

The Paris Agreement also recognises that "climate change represents an urgent and potentially irreversible threat to human societies and the planet and thus requires the widest possible cooperation by all countries, and their participation in an effective and appropriate international response, with a view to accelerating the reduction of global greenhouse gas emissions".

In this context, the purpose of this Roadmap is to set up a collective framework for the building and construction sector to match the climate related objectives set out in the Paris Agreement, i.e. for the world to stay well below 2°C and to be carbon neutral in the second half of this century.

It is by no means a prescriptive roadmap for countries. This document at a global level can help policy makers when designing their national building and climate strategies, as well as organisations in designing their long-term and medium-term policies and determining their investments allocations. It is aiming at identifying global goals and milestone and therefore does not replace a much more detailed Building and Construction Roadmap that would have to take into account the different circumstances of the countries and be flexible as far as its detailed implementation is concerned.

This Roadmap is developed by the Global Alliance for Buildings and Construction (GABC)*[5], which is a coalition of over 90 states and non-states actors, aiming to work towards a low carbon and resilient building sector.

The roadmap is a "LIVING document"

which will allow adaptation over time and stick as close as possible to regional and local needs and trends in the buildings and construction sectors.

3 *Under the UNISDR, the Sendai Framework is a 15-year, voluntary, non-binding agreement which recognises that the State has the primary role to reduce disaster risk (including climate risk) but that responsibility should be shared with other stakeholders including local government, the private sector and others. It has seven targets and four priorities for action. For more information: http://www.unisdr.org/we/coordinate/sendai-framework.*

4 *Following the Millennium Development Goals (2000-2015), the 2030 Agenda for Sustainable Development sets 17 Sustainable Development Goals. The 7th goal concerns access to affordable and clean energy for all and sets the objective of doubling the global rate of improvement in energy efficiency by 2030.*

5 *Every time there is the "*" sign, it means that the concept is further explained in the glossary.*

AN INDUSTRY IN FOCUS

The building sector is a both traditional and innovative industry: it accounts for between 5 and 10 % of the national GDP of each and every state in the world. Buildings are also assets that represent 50% of global wealth. Hence, a policy on building investment has a major impact on our economy; the financial dimension and business models for the sector will be further developed in a future, second version of this Roadmap.

Policies on buildings and construction have a social impact. Indeed, the building and construction sector is a major employer with 10% of the employment of the workforce, and has a multiplying effect (1 job in construction generates 2 jobs in other sectors, FIEC): it requires a large spectrum of qualifications and in some countries it plays a social role for the integration of migrants into the host society.

Moreover, the activity of the building sector is a highly "local" and the sector is a "low concentrated" industry, with no large businesses having control of the value chain, and it has low entry barriers facilitating the fragmentation of the value chain. Dissemination of innovation is also slow, largely due to this fragmented structure, even though the building sector answers to complex situations by prototype solutions. For this reason, there is a lack of a common and international vision from the different actors in the buildings sector. Thus, it is crucial to facilitate a common language and vision, foster transparency, inclusion and cooperation among these stakeholders, implementing a strong long-term policy and instruments and integrating emerging and innovative technologies into every-day practices.

Investing in buildings and infrastructure provides an opportunity to tackling the central challenges facing the global community: reigniting growth, creating and maintaining jobs, delivering on the Sustainable Development Goals and reducing climate risk in line with the Paris Agreement.

6 *Global Construction Perspectives and Oxford Economics. 2013. "Global Construction 2025: A Global Forecast for the Construction Industry to 2025."*

I. METHODOLOGY AND PRINCIPLES

1 Building-related GHG emissions

1.1 *Definition of "building-related emissions"*

The building sector accounts for nearly one-third of global energy consumption and half of global electricity consumption. Moreover, around 20% of global GHG emissions are building-related (Scope 1,2,3). To define what is meant by "building-related emissions", we refer to the 3 scopes defined by the ISO 14064 methodology[7].

Building GHG emissions are generated by all the following emission sources:

- **Scope 1 - direct emission sources from buildings:** they are all the GHG sources located physically in the building, mainly fossil-fuel consuming equipment (e.g. boilers, oil lamps…), as well as heating and cooling systems using Fluorinated F-Gas[8], and marginally insulation material. Cooking with gas or fuel also accounts as a major source of GHG emissions[9].
- **Scope 2 - indirect emissions sources from building energy consumption:** mainly building electricity use, plus commercial heat[10] from district heating and cooling. The electrical demand in buildings induces GHG emissions in the power sector. Electrical uses include notably: the consumption by electrical equipment that are incorporated in the building (e.g. heating and cooling systems, electric lighting, elevators, pumps) and consumption of electrical goods (e.g. household appliances) and other related service equipment (e.g. IT goods).
- **Scope 3 – Buildings' indirect emissions from other sources:** Scope 3' borders are not clearly defined: it mainly concerns embedded emissions from building materials and the GHG emissions generated by urban planning decisions (e.g. unnecessary travel or traffic induced by building location).

7 *The ISO 14064 standard (published in 2006) is a three-part international standard for GHG management activities, including the development of entity emission inventories.*

8 *F-Gas have an impact on the ozone depletion and a strong global warming potential (GWP).*

9 *UNFCCC Common Reporting Framework does not take CO_2 emissions of biomass combustion into consideration, because variations of the biomass stock are reported under LULUCF inventory.*

10 *In statistics, heating and cooling are considered "heat".*

Table 1 **Emissions of GHG from real estate**

	Emissions sources & fields covered by the Alliance (building-related)	*Not Covered by the Alliance (energy consumption in buildings which are not building-related)*
Scope 1	***Direct emissions (from consumption of natural gas, fuel…and F-gas fugitive emissions)***	
	• space and water heating (gas, fuel,..boilers) • heating and cooling systems (F-Gas) • insulation materials (F-Gas)	• cooking (gas and fuel cooking) • fuel use (e.g. kerosene) for lighting (notably in developing countries)
Scope 2	***Indirect emissions from energy consumption (electricity and heat district)***	
	• electric heating and cooling systems (including hot water) • district heating/cooling demand (including hot water) • artificial lighting demand • other building services (elevators, pumps and mechanical ventilation systems use)	• cooking (electric cooking) • lamp performance • IT systems and products • domestic appliances and other electrical goods (see note below)
Scope 3	***Buildings' indirect emissions from other sources***	
	• embodied GHG and energy in materials (concrete, glass, steel, wood...)	• traffic induced by building users
	Link with other sectors	
	• decarbonisation of energy supply • urban planning minimising heat islands and optimising solarisation etc.	• coastal sand • urban planning minimising the use of transportation

Note on appliances: Scope 2 in the Roadmap focuses only on electricity demand from equipment incorporated in the buildings. The part of appliances and IT products in buildings represents 14% of the energy consumed in buildings. This part should grow as buildings become more energy efficient. For social purposes, incentives to choose energy efficient appliances, such as energy labelling and eco-design, could be coupled to some building developments.

1.2 *Links with other sectors (energy supply, transport and coastal sand extraction)*

Deep decarbonisation of our societies needs a systemic approach. As stated above, Scope 3's limits are not clearly defined, yet, the building sector has an influence on three other main sectors having an impact on climate change:

1. Energy: buildings professionals are the main responsible for the level of energy demand of buildings (i.e. the building envelope* determines the energy demand that has to be satisfied by building equipment, such as boilers for heat and fans for air flow). Yet, as far energy supply is concerned, their responsibility depends on the local availability of de-carbonised energy (either directly on-site or through the local energy grid). In the majority of cases, building-related decarbonisation will also necessitate upstream decisions by the energy industry (i.e. decarbonizing the power sector).
2. Transport: travel and traffic induced by building users has a large impact on global GHG emissions, which can be as important (or even more important) than building energy consumption depending on the type of building and its location (e.g. office building complexes outside city centres). Some building actors (e.g. developers and urban planning authorities) are directly concerned and are partially responsible for these emissions, as they select the location of buildings, taking into consideration land use and construction permits.
3. Coastal sand extraction: to build with concrete, there is a need to extract each year 30 billion tons of sand (UN Environment, 2014), equivalent to nearly 4 tonnes per person. The majority of this sand is extracted in river and coastal areas, which increases the vulnerabilities of coastlines, where an important part of human settlements is located.

The decarbonisation of energy supply is strictly linked to "building-related GHG emissions", and will be addressed in the Roadmap. Other factors such as urban planning that minimise the use of transportation and coastal sand and gravel extraction are considered without detailed targets attached (See Table 1).

Every time there is the "" sign, it means that the concept is further explained in the glossary.*

2 Relevance of emissions covered by the Roadmap: 20% of total GHG worldwide

A first evaluation of the emissions covered by the Roadmap can be based on the following proxies:

1. As for Table 1, energy includes: heating (56%, 11.8 petawatt-hours [PWh]), hot water (23%, 5 PWh), lighting (12%, 2.6 PWh) and cooling (9%, 1.8 PWh), which represent around 22% of global final energy consumption and around 13% of total GHG emissions[11] (IEA, 2016; IPCC, 2015, own calculation).
2. F-Gas: emissions of F-Gas are estimated around [1,5[12]] Gteq CO_2, or [3%] GHG emissions. F-Gas monitoring is assured under the Montreal Protocol* and the UN Framework Convention on Climate Change.
3. Materials: Even if embodies GHG in building materials do represent 15-20% of the total lifecycle GHG emissions of a building, the production of construction materials represents a significant proportion of total GHG emissions (figures range between 8-15% of total GHG emissions for concrete, steel and bricks, whose cement represents 3%).

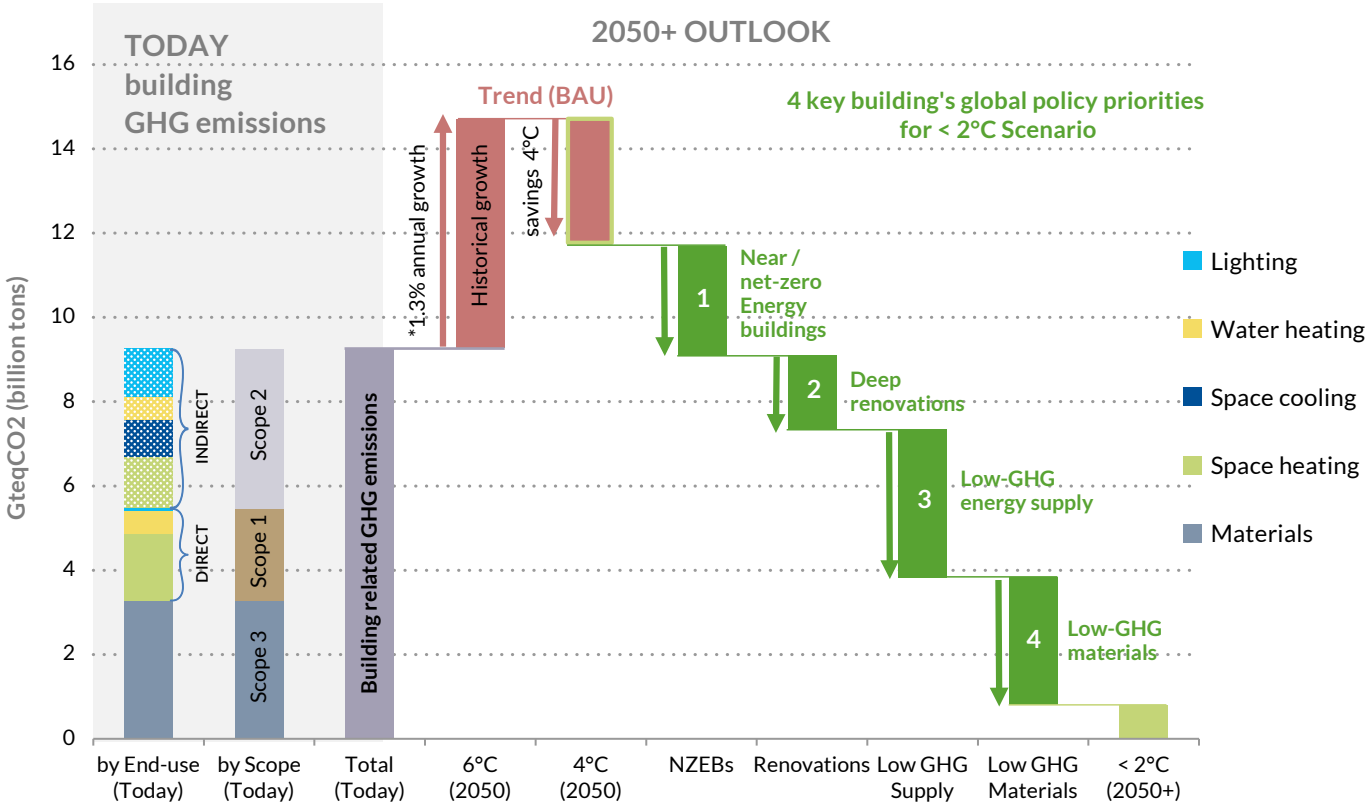
Every time there is the "" sign, it means that the concept is further explained in the glossary.*

11 *Energy data from the IEA Energy Technology Perspectives 2016 publication; Buildings-related GHG emissions estimated from the IPCC 4th report, in Final energy, 1 Pwh = 1 million of Gwh or 1 000 Twh and represents for example more than twice the annual electrical consumption of France.*

12 *This figure is illustrative. It is necessary to identify the emissions of F-Gas coming exclusively from fixed installations and not from industrial processes.*

All together these three sources of emissions account for nearly 20% of total GHG emissions worldwide.

Figure 2 **Split of global building-related emissions and emissions reduction potential**



Source: IEA Energy Technology Perspectives 2016

3 Guiding principles of the Roadmap

Building-related emissions, accounting for roughly 20% of global GHG emissions, will play a critical role in achieving the goal stated by the Paris Agreement to remain well below 2°C, especially given the long service life of buildings and the speed of global decarbonisation of the power sector.

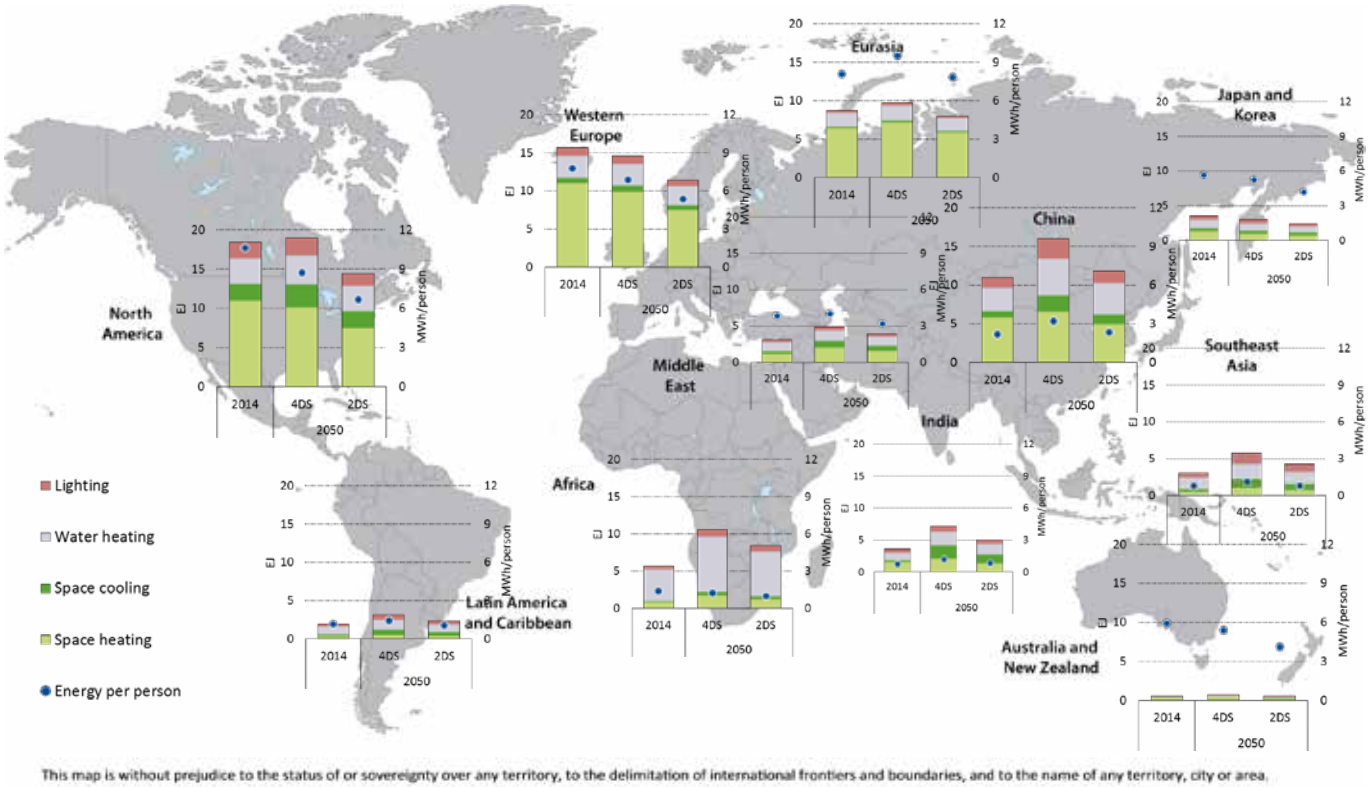
In defining a global roadmap to decarbonise the sector before the end of the century, it will be critical to take into account 5 major issues:

1. Energy efficiency first: reduce the energy demand from the building sector to its minimal level

Measures on energy saving are the most economically efficient mitigation actions, as they often come at a negative cost. Yet, they are not systematically implemented as they face many non-economic barriers (e.g. households' debt capacity…). As new buildings will mostly be in developing countries in the coming decades, building nearly zero emission buildings becomes a priority.

In industrialised countries the priority is to reduce drastically and as soon as possible before 2050 the energy consumption of their building stock, as new buildings are a very small part of all buildings.

Figure 3 **Buildings sector final energy demand in 2050**



Note: Final energy demand here represents energy consumption for space heating, water heating, space cooling and lighting in buildings. It does not include cooking, appliances or other building energy services. The 4-degree Celsius scenario (4DS) represents a global energy and emissions trajectory that takes into account recent pledges by countries to limit emissions and improve energy efficiency, which help to limit average global temperature rise to 4°C. The 2°C scenario (2DS) lays out an energy systems deployment pathway and emissions trajectory that is consistent with a 50% change of limiting average global temperature increase to 2°C.

Source: IEA Energy Technology Perspectives 2016

Energy efficiency to increase access to energy: Improving the energy efficiency of buildings has many co-benefits. One of them is a reduction in total energy demand, often an important factor in countries where energy access is still a priority. There is an obvious link between an efficient building sector in these countries and energy for all. Indeed, SDG 7 sets the goal of doubling the energy efficiency trend to be in line with the climate goals but also to enable an equitable development of every country.

Energy efficiency to increase comfort: To satisfy occupant needs and comfort in **buildings, energy services** (e.g. providing temperature and humidity control and lighting adapted to end uses) are required. Energy (e.g. gas and electricity) is the carrier through which those energy services are provided.

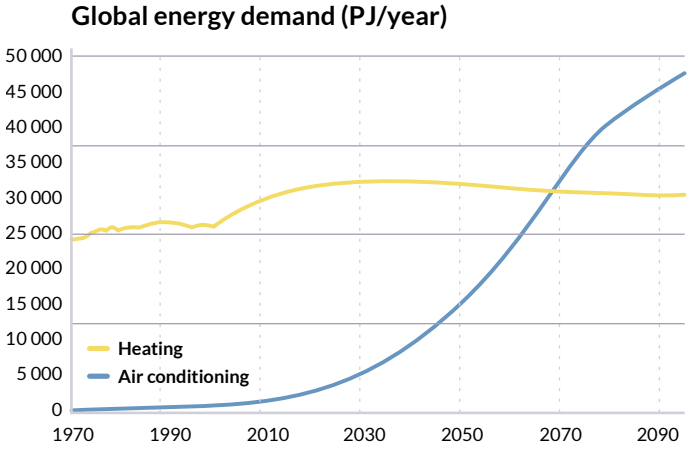
Many cost-effective, market-available solutions already exist to provide the energy services that satisfy occupant needs, both through passive design approaches (i.e. architecture, building envelope, solarisation) or through appropriate equipment specifications (i.e. sizing, appropriate dimensioning, technology choice and energy efficiency of building equipment and products). For a 2°C trajectory, or below, both energy-efficiency and low-GHG design and equipment will be necessary.

Energy efficiency at a negative cost but facing implementation barriers: Typically, the immediate potential benefit of energy-efficient solutions is the financial gain achieved through energy saving, even though there can be potential "rebound effects" from reduced cost of the energy service. Yet, the financial gain alone is not always enough to drive investments in building energy efficiency. Decisions for significant works on buildings are often motivated by numerous factors, including patrimonial value, adaptation to change of uses and improvement in comfort. Upfront investment costs, despite long-term cost savings, can also be a major barrier to energy efficiency improvements in buildings. Consequently, it is crucial to embed energy efficiency in every major step of a building's life-cycle and

Increase of cooling issues

As developing countries and emerging economies continue to grow, one major change expected in the global built environment is a shift in heating and cooling demand. Whereas there are important challenges and barriers to improving building heat demand in most developed economies, space cooling demand will rise steadily across nearly all regions, and in particular in rapidly emerging economies with warmer climates.

Figure 4 **Projected global energy demand for heating vs cooling**



Large spectrum of action: Building professionals can act to improve the energy efficiency of building envelopes and equipment during the design, construction and management phases, even if this applies differently:

- **for new** and **existing** buildings,
- in **hot** and **cold** climates[13]
- **for the different real-estate segments, including:**
  - single-family houses and attached housing,
  - multi-storey housing buildings,
  - social housing,
  - private service buildings (e.g. offices and commercial space),
  - public buildings (e.g. schools, hospitals and public forums), and
  - informal settlements.

Residential housing, representing roughly 3/4 of global building floor space (IEA, 2016), is the main segment at stake, although it can also be more difficult to address as it is a fragmented segment (i.e. various owner, rental and occupant arrangements) that is typically built, renovated or maintained by an equally fragmented mix of individuals, small enterprises and buildings-related institutes or organisations (e.g. public housing agencies and housing associations).

13 *According to the Köppen climate classification system, hot climates cover group A, B and part of C, and cold climates cover group D, E and part of group C.*

Consequently, it is often easier to:

- start energy efficiency with more concentrated building segments such as social housing, public buildings and large private service buildings;
- focus first on buildings with large potential energy efficiency gain and emissions reduction;
- consider a large-scale effort, in order to create appropriate market scales for cost-effective material and equipment;
- collaborate with manufacturers and retail networks, as they play an important role in fostering and accelerating technology diffusion of high-efficiency material and certified equipment;
- ensure that continuous training is available to all key actors in the industry.

2. **The need to take immediate action, given the investment cycles in buildings.** The investment cycles related to the various sources of emissions in buildings have different life spans: some investments or actions will have short-term results (e.g. improved energy efficiency and reduced operating emissions), while others will only show results in the longer term (e.g. life-cycle emissions from new construction of low-carbon, energy-efficient buildings). The lifetimes of those investments represent different challenges and opportunities. By 2050, for example, boilers will have had 2 to 3 cycles of investment, while roofs and building facades are likely to only have had 1 to 2 cycles of renovation. Thus, renovation works would need to be coordinated strategically over time, to avoid lock-in of carbon-intensive investments. This coordination should also extend to the energy performance and GHG intensity of building equipment, to ensure that the most efficient, cost-effective and least carbon-intensive investments are made over the coming decades. It is hence crucial to seize all opportunities at every investment stage to improve building energy performance while ensuring that those investments are aligned with long-term energy and emissions ambitions.

3. **The links with upstream energy and emissions, as electricity and heat have to be taken into account.** The supply sector (e.g. for district heating and cooling) is of fundamental importance to the buildings sector, where electricity and commercial heat account for nearly [40%] of global final energy consumption in buildings (IEA, 2016) including appliances. Conversely, a major demand on the supply sector comes from buildings: half of global electricity consumption is used in buildings, and the buildings sector is the first consumer of natural gas in many countries. Dramatic reductions of building energy demand will have a strong impact on the overall energy sector, while decarbonising energy supply will contribute to a decarbonised buildings sector.

4. **The diversity of national circumstances has to be taken into account in setting global policies and technical goals for the built environment.** Every country has different norms to follow and different objectives according to its own national priorities. For instance, the demolition and reconstruction rhythms, the demand for new housing, and the perceived comfort for heating and cooling needs vary greatly across countries due to climate, socio-demographic influences and cultural and behavioural norms. Hence, a flexible technology policy approach is crucial to meet challenging performance goals across the global buildings sector.

5. **Effective integration of all levels of government remains a key component to unlocking cohesive policies, strategies and plans in the building and construction sector,** to advance Nationally Appropriate Mitigation Actions (NAMAs) and NDCs.

Local and subnational governments often have the mandate to adopt and implement building efficiency codes and standards, certifications and performance information and energy efficiency improvement targets.

In addition to regulation, local and subnational governments can incentivize and finance smart, compact, low-carbon development, serving as hubs to spur growth and connect a wide range of stakeholders - from builders, technology developers, manufacturers and utilities to business and household consumers.

National governments have the power to set enabling framework conditions for visionary roadmaps, policies and plans, to accelerated low-carbon urban development for enhanced action at all levels of government.

II. TOWARDS ENERGY-EFFICIENT, ZERO GHG EMISSIONS AND RESILIENT BUILDINGS WELL BEFORE THE END OF THE CENTURY

Unlike other sectors, the building sector varies substantially from country to country, which means that the needs and measures required to decarbonise it are different according to locations. This **Roadmap identifies the following key steps** to enable the transition towards an energy-efficient, low-GHG and resilient real estate that can be implemented in different ways through different mixes of measures, whilst still converging towards the same end.

The Roadmap is not composed of sequential steps, but it presents a logical order or priorities. It can also be considered as a frame to present and report policies and measures for the transition to a low-GHG real estate.

1 Implement urban planning policies for energy efficiency

The form and compactness of buildings, as well as mutual shading, have a great influence on energy demand in buildings and solar power capacity. They are framed by rules set in urban planning policies. Their impact on energy consumption and local energy production should be taken into consideration when defining urban planning policies and urban development projects (e.g. new urban districts).

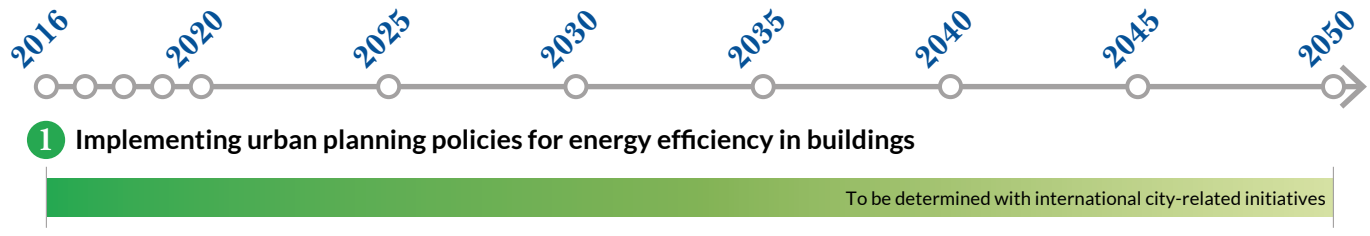
a A global target could be that all countries have urban planning policies in place that take into account the long term goal of decarbonising the building sector.

b It may include reinforced targets for new district development, as a systemic approach integrating energy demand and supply at district level delivers more efficient solutions. District heating and cooling systems have to be integrated in planning policies as well: a related target could be set up that include the number of buildings connected[14].

Furthermore, urban planning plays an important role in the prevention of climate risks exposition (e.g. avoid critical equipment in the lower floors…).

14 *This aspect is included in II.5 „Decarbonized energy".*

Graph1 **Timeframe for urban planning for energy efficiency**



2 Accelerate the improvement of existing buildings' performance

Considering the fact that in many countries the existing building stock (= not recently completed buildings) today will represent the large majority (i.e. 2/3 or more) of the overall building stock (floor area) and building-related emissions in 2050, the performance of today's existing buildings has to be improved to be close to zero emissions at least by 2070[15] through an increase of the renovation rate*[16] as well as an upgraded level of energy efficiency performance required. In addition to deep renovation (see footnote 16), maintenance and replacement works on existing buildings can benefit from the integration of energy efficiency measures as a no-regret solution.

In any case, increasing renovation rates needs a better access to finance.

15 *2 degrees' scenarios (2DS) targets require us to go to zero emissions absolute by 2100 (Paris Agreement). Other scenarios well-below 2 °C suggest to go to zero emissions closer to 2050-60. 2070 is a temporary proposal to be discussed by scientific experts.*

16 *Standalone works concerning equipment and building components (e.g. boilers, windows…) decided in the context of maintenance and replacement are not considered as refurbishments and are not counted in the renovation rate. Renovation rate concerns only deep renovation, meaning a coordinated package of works that significantly reduce the energy consumption. In the IEA Technology Roadmap on Energy Efficient Building Envelopes (2013), deep renovation is considered to mean refurbishment that reduces energy consumption by 75% and limits energy consumption for heating, cooling, ventilation, hot water and lighting to 60k Wh/m²/yr (GBPN, 2013).*

2.1 *Significant increase of renovation operations including energy efficiency.*

Renovation rates for deep energy-efficient refurbishments have to be increased so that the global building stock is fully renewed by 2070:

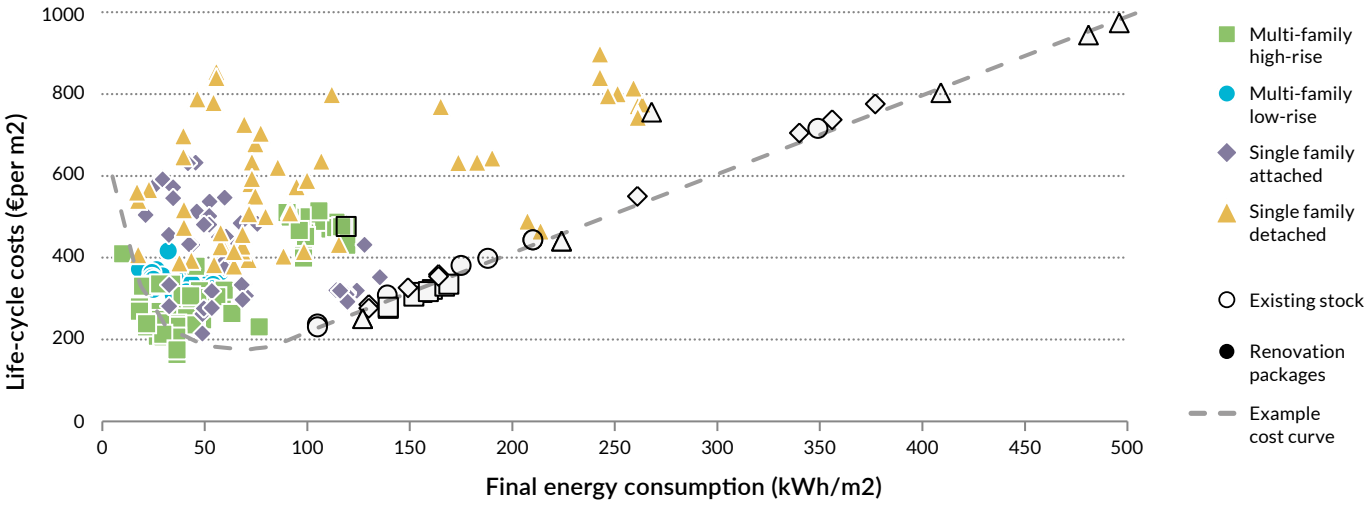
a **Renovation rates in industrialised countries to reach 2% on average of the existing stock by 2025 and 3% by 2040.**

Today's renovation rates generally amount to 1% or less of the existing stock each year, typically with energy efficiency improvements in the order of 10% to 15%. These improvement rates are not in line with global energy and emissions targets to limit average temperature rise to 2°C or less. Moreover, numerous studies have demonstrated that these levels of renovation investments are often not at the cost-effective technical potential of building energy-efficiency measures.

b **Renovation rates reaching 1.5% by 2025 and 2% by 2040 in developing countries.**

c **Quick-win solutions:** a key element should be to pursue policies that will ensure that this area is improved for all buildings but especially for government assets as an initial initiative.

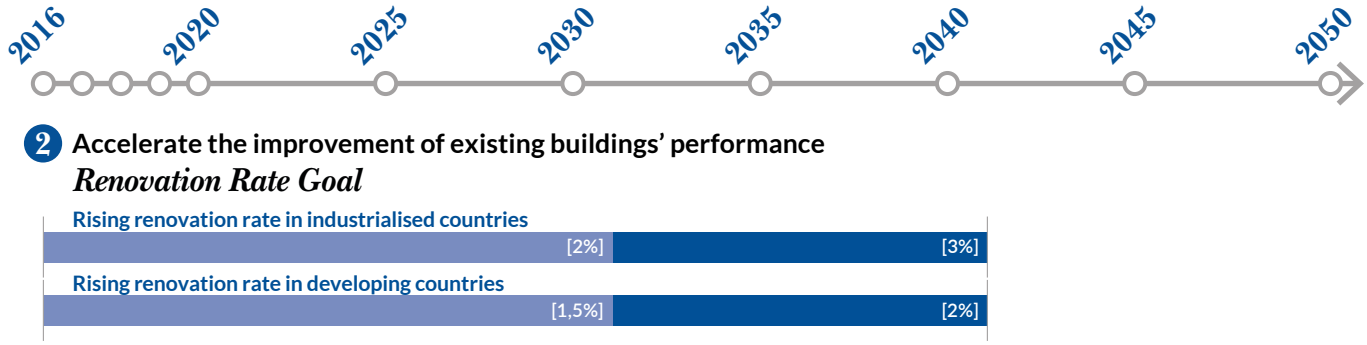
Figure 5 **Example of existing versus potential building envelope renovation packages in Turin, Italy, relative to life-cycle costs**



Note: This figure shows an optimum of renovation cost around 50/60 KWh/m²

Source: IEA Energy Technology Perspectives 2016 with Torino Polytechnic University (IEA, 2016)

Graph2.1 **Timeframe for Energy Renovation activity**



2.2 *Upgrade of the level of energy efficiency of each operation, in line with long-term standards:*

a Set up global progress performance goals for heating and cooling demand after deep renovation [wh/m²/HDD* or CDD* + sustainability criteria according to cold as well as hot climate].

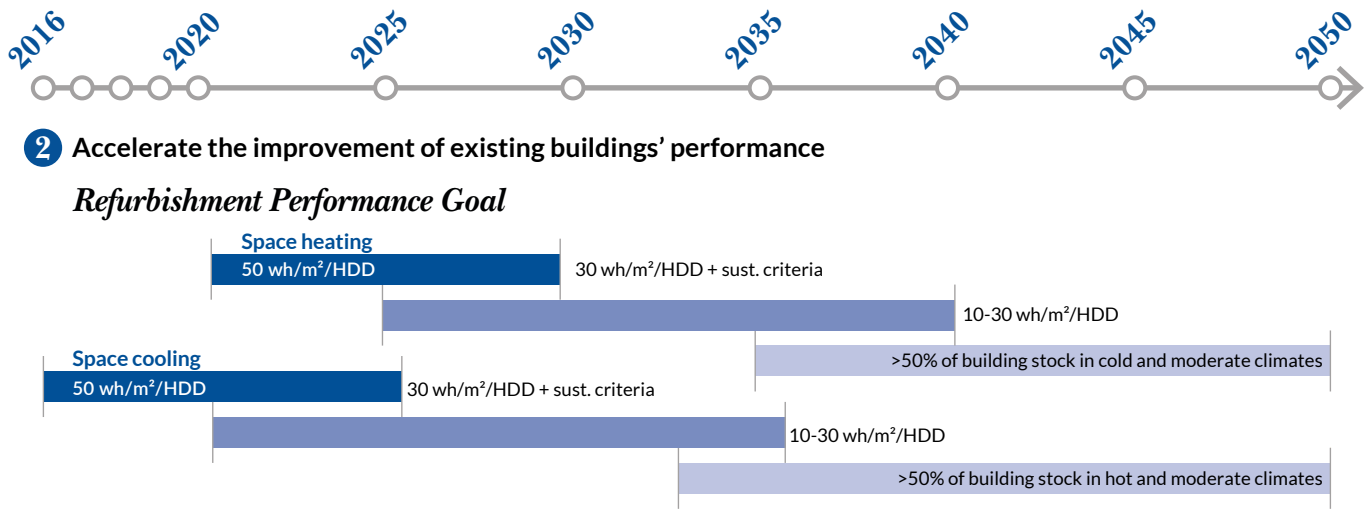
17 *Depending on the building type, roughly system losses can represent 50% of heat consumption.*

b For maintenance and replacement works, partial improvements can be achieved as a step leading to deep renovation (see renovation booklets or passports 1.3) for roofs, windows…

In both cases, a mix of policy instruments that take into account different interests of tenants and landlords can be used to upgrade the level of energy efficiency. Recommendations in that regard include:

- Promotion of energy-efficient refurbishment of the building envelope (e.g.: R* min or U* max or Gain or max heating and cooling demand); including air sealing, highly isolated windows.
- Replacement of inefficient heating and cooling systems (e.g.: COP*<1,5 for heating and COP<2,5 for cooling before 2025).
- Improved efficiency of boilers and especially hot water heaters. Encouraging the up-take of performant heat pump and solar system for space and water heating.
- Optimizing the energy use of technical buildings systems by appropriate dimensioning, system adjustments and control[17] (e.g. effective controls for generation, distribution, and emission at full and partial demand loads to match energy use to building and occupant needs.
- Integration of renewable energy systems.
- Reinforced targets for renovation of clusters of buildings or districts.
- Introduction of tools (such as building passports) to allow for step by step (staged) deep renovations.

Graph2.2 **Timeframe for Energy Renovation performance**



3 All new buildings achieve nearly net zero operating emission performances

In the current context of worldwide population growth (2,5 billion increase by 2050), the global stock of buildings is estimated to grow in m² by over 90% by 2050 (IPEEC), which means an increase of around 200 billion m². Hence, the priority should be given to policies, regulation and guidance that promote energy efficiency and functionality and that facilitate passive solar design by site design, layout and fenestration, taking into account a life cycle approach when data are available. There is increasing evidence that well-designed energy-efficient buildings often promote occupant productivity and health (Fourth Assessment Report of the IPCC, 2007). In many dense areas, net-zero operating emissions goals will be considered at the system level: campus, community or district level with decarbonised electrical or heat grids.

3.1 *Achieving a large uptake of nearly Net-Zero Operating Emissions from new buildings*[18] before 2025 in cold climates[19] (where all new buildings can be at least passive).*

3.2 *Achieving a large uptake of nearly Net-Zero Operating Emissions from new buildings by 2030 in hot climates[20] where the temperature challenges require different responses.*

Feasibility and cost-effectiveness must be considered in the aim of increasing the number of Net-Zero Operating Emissions Buildings.

At the conception and construction stage, this can be done through:

- **Ambitious thermal regulations or incentives for new constructions** that include:
  - (a) very low energy demand for heating and cooling
  - (b) ambitious primary energy performance targets to be defined
  - (c) targets for using renewable energy sources to cover the largest possible share of the remaining energy demand of the building
- **Development of mixed usage buildings** (alternate housing and office floors in the same building) to smooth peaks of energy demand and raise the overall energy performance of the building.

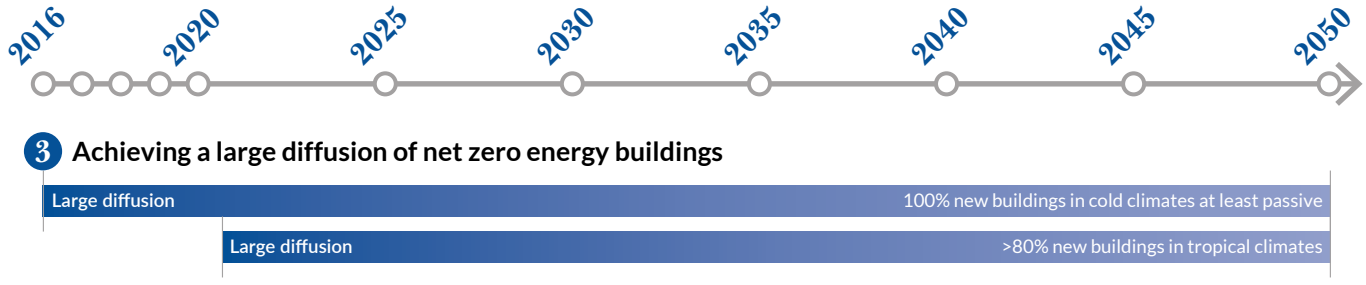
This requires major changes and the mobilisation of the entire value chain

of particular importance will be the consideration by architects and policy makers of:

- Place and envelope
- Bioclimatic architecture that minimises air conditioning demand in all climate zones
- Local and traditional knowledge and materials
- Technology transfer

During the life cycle of buildings, it will be essential ***to keep the remaining energy demand as low as possible (see next session on improving the management of buildings).***

Graph3 **Achieving a large diffusion of net zero operating emissions buildings**



Every time there is the "" sign, it means that the concept is further explained in the glossary.*

18 *It is recognised that total life-cycle GHG emissions are the most relevant impacts on the environment, but given the difficulty of calculating embodied emissions, operating emissions are considered to be an adequate measure for this first cycle of the Global Roadmap.*

19 *See footnote n. 13. This also includes intermediate climates.*

20 *See footnote n.13. This also includes tropical climates.*

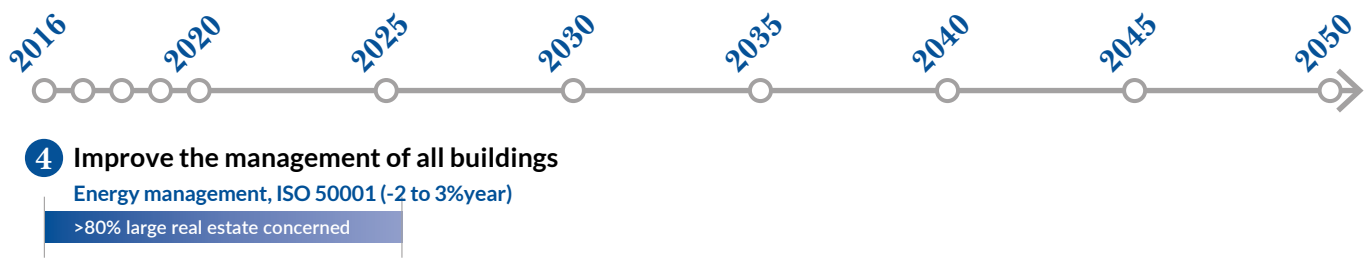
4 Improve the management of all buildings

The delivery of highly energy-efficient new or renovated performant buildings is essential. Yet, it is equally important to maintain this performance over time. It is crucial to optimize not just technologies, but behavioural and operational aspects of energy and GHG performance. To do this, design and management tools must integrate the issue of energy management. Objective-based building management policies like ISO 50001, or renovation booklets, are good examples of such tools.

Policy instruments to improve energy management in buildings include:

- Developing energy management practices with a target of energy reduction of 2% to 3% per year or 20% to 30% by 2025], with the aim to cover 80% of large real estate by 2025.
- Deploying individual cost-effective room temperature control and energy metering especially for residential, and digitalisation of controls for service buildings with a target of 100% by 2030. Better knowledge of energy consumption thanks to energy metering allows for a reduction of energy bills of a few percent. The introduction of energy metering and energy control in service buildings can achieve from 10% up to 30% energy savings of the controlled energy (mainly lighting, heating and cooling) and is a quick win solution.
- Promoting information (for individuals and companies) to ease behaviour change and investment decisions for energy efficiency and renewable energies.
- Define metrics for occupancy rates of buildings to evaluate useless energy consumption or energy amortisation of embedded energy in materials and increase occupancy rates when socially acceptable. Thus, in management rules it is essential that multiusers for the same space are allowed.
- Developing individual building renovation booklets or passports with ambitious energy efficiency targets to be able to coordinate works over time, which are in line with the long-term strategy of decarbonizing the building stock. Each building will thus have a long-term strategy which is adapted to its own circumstances.

Graph4 **Timeframe for Energy management goal**



5 Decarbonised energy: decarbonise the energy and power supply for buildings load

As previously stated, buildings are not standalone energy objects but are deeply connected to energy grids, especially heat district grids. The remaining energy demand for heating and cooling, as well as lighting, should be covered by decarbonised energy, preferably by renewable energy (including heat pump technologies). On-site produced renewables should be preferably taken into account. Moreover, new energy services can be provided by buildings, such as energy storage (i.e. smart grid services and thermal storage).

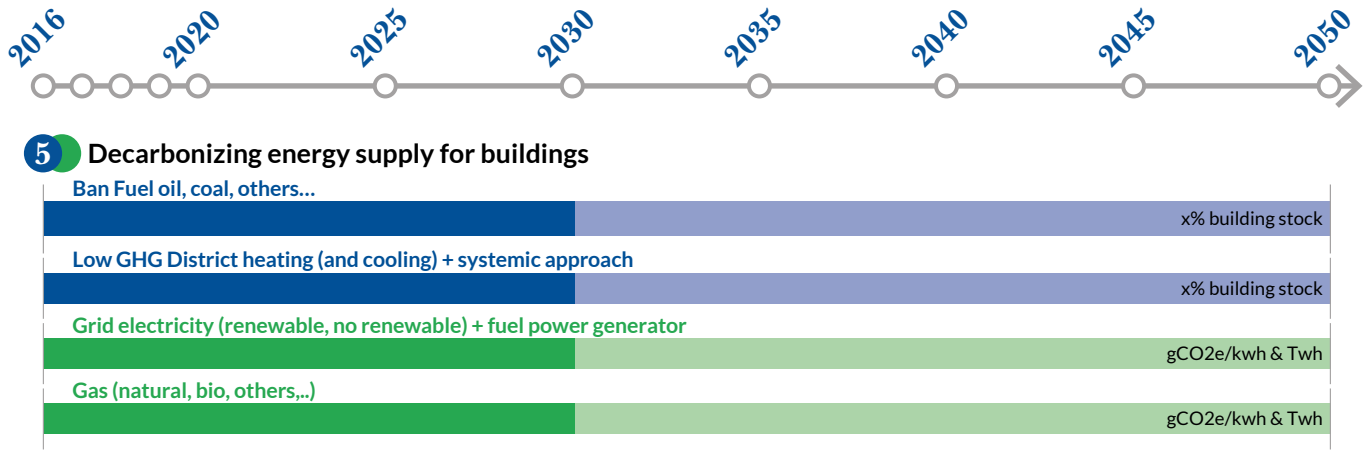
Thus, the building sector has a major influence on lowering the demand of high GHG content energy supply, mainly through the following actions:

- **a** Integrating on-site renewable energy if possible and economically more advantageous (as in Net-Zero Energy Buildings for instance).
- **b** Reducing drastically the installation of boilers using high GHG fossil fuels like coal and fuel oil.
- **c** Increasing the number of buildings connected to low-GHG heating and cooling district supply.
- **d** Developing energy services based on the valorisation of the thermal mass effects (i.e. inertia, phase change).

Still, it is important to recall the decarbonization targets of energy supply to ensure consistency. Energy policy has to have a dedicated chapter on decarbonisation of energy supply to buildings (see the IRENA* and IEA* Energy Roadmap) such as electricity, gas and heat.

- **a** Decarbonizing electricity, which is the base of all deep decarbonisation pathways.
- **b** Reducing the GHG content of gas supply. In many countries a gas network has been deployed, for which the buildings are the first clients. These networks can be used to inject low-GHG biogas and synthetic gas.
- **c** Using only biomass with no negative impact on LULUCF*. Biomass use for heating has a very low GHG footprint under the condition that it does not contribute to deforestation.

Graph5 **Timeframe for decarbonizing energy supply for buildings**[22]



Every time there is the "" sign, it means that the concept is further explained in the glossary.*

22 *Colour code of the graphs: green recalls goals addressed by actors/sectors/communities other than the building's sector ones. In this case, they are addressed by the energy supply sector.*

6 Reduced embodied energy and GHG emissions: reduce environmental impacts (life cycle approach) of materials and equipment: manufacture (extraction included), transport, maintenance, use and end-of-life

Construction activity in the building sector is generating a major flow of materials in every country, evaluated at 24%[23] of global raw materials removed from the earth with a large impact on climate change: GHG emissions or energy consumption are linked to every phase of the life cycle[24] of materials, from extraction or harvesting to manufacture, transport, construction, use and demolition. For instance, steel, bricks, cement (3% of GHG emissions), non-certified wood (deforestation issue), or heating and cooling systems using F-Gas (3% of GHG emissions), are some of the major building products or equipment and emitters of GHG. Technical solutions do exist. Furthermore, recycling construction materials represents a large benefit in GHG reduction.

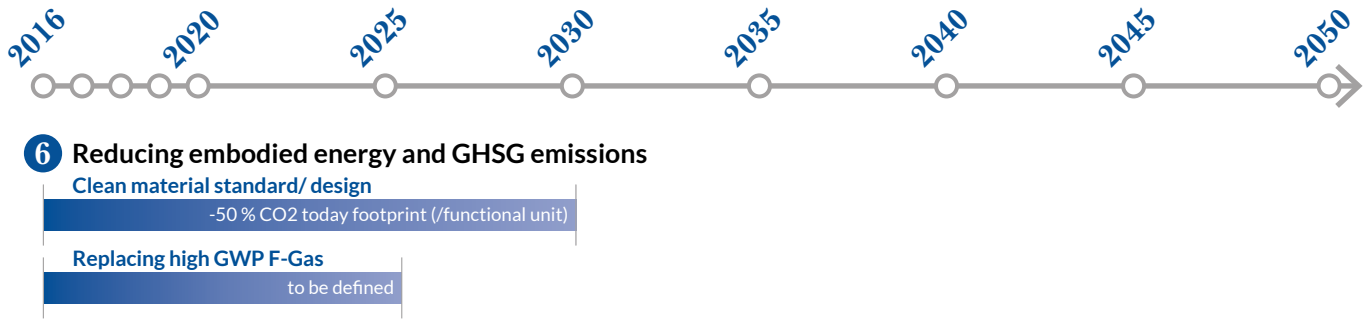
To sum up, scope 3 generally represents between 10 and 20% of buildings' carbon footprint. For Near/Net-Zero Buildings, this can reach 50%[25]. Thus, from now on, it is important to minimise embodied energy and GHG emissions of construction materials and technical systems, firstly for new buildings, and on a longer run for renovation of existing buildings.

Reduce the energy and GHG footprint of the major (in quantity) building materials; average -50% (functional unit) by 2030[26] and replace high global warming potential F-gas in heating and cooling system.

THIS CAN BE ACHIEVED BY:

- a **Developing (cradle to grave, and when possible cradle to cradle) life-cycle approach in the building sector, so that a systemic, material-neutral and performance-based approach is guaranteed (positive global assessment).**
- a Promoting wide knowledge and the adoption of low-carbon materials and technologies (e.g. wood and earth constructions, innovative concrete[27]) amongst professionals involved in the design and building process.
- a Acknowledging vernacular solutions as an alternative for low-carbon construction methods and bioclimatic performance.

Graph6 **Timeframe for reducing embodied energy and GHG emissions**



23 *EU LoRe-LCA project (FP7)*

24 *The norm EN15804 describes a methodology of the CO_2 footprint assessment of any building products.*

25 *These figures are based on carbon-footprint calculations of real estate projects (mainly in France).*

26 *This point has to be clarified. Functional unit allows fair comparison of GHG performance.*

27 *Carbon footprint reduced by up to 70%.*

7 Reduce energy demand from appliances

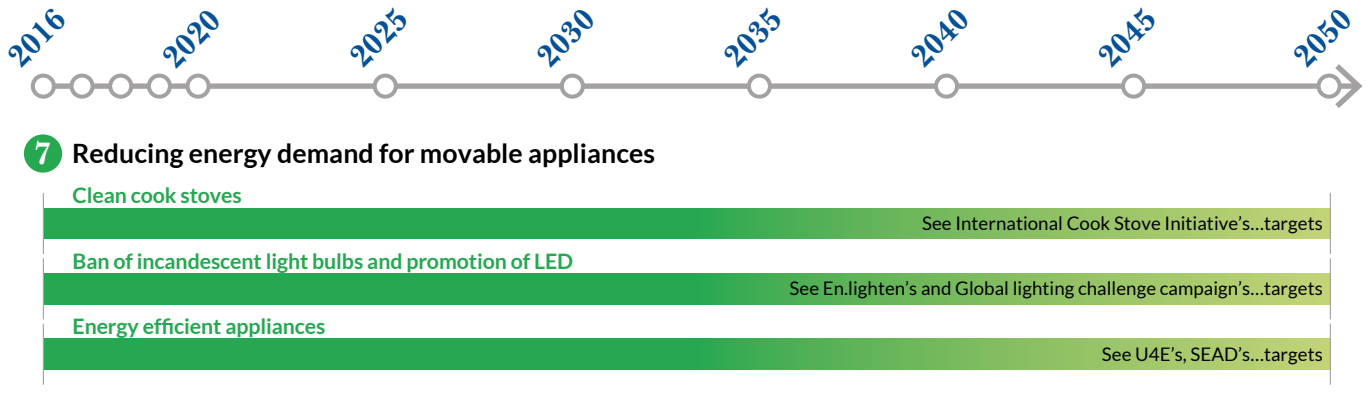
Emissions induced by the energy consumption coming from the use of movable indoor appliances (refrigerator, washing machine, IT equipment, lamp, hair dryer...) are growing. The individual gain in energy efficiency of each type of equipment does not compensate the larger use of this equipment by households or enterprises. The electric and electronic appliances' community is the most concerned.

This Roadmap does not set a specific target related to appliances, as other initiatives are directly targeting this issue, which is less under the direct responsibility of building professionals and more that of the consumers and appliance producers.

Many initiatives are also actively attempting to reduce the GHG emissions related to appliances, for instance (non-exhaustive list):

- **Cooking:** the International Cook Stove Initiative supports clean alternatives to wood-cook stoves. In that regard, IEA recommendation is to mandate minimum energy performance to achieve clean and sustainable cooking systems
- **Lamps:** UN Environment en.lighten calls for the ban of incandescent light bulbs and promotes LED deployment; the Global lighting challenge campaign's call for the deployment of 10 Billion High-Efficiency Bulbs initiated by the Clean Energy Ministerial. IEA recommendation, over this ban, is to set after 2025 a minimum performance of 100 lumens/watt for lighting
- **Appliances:** United for Efficiency (U4E) UN Environment-GEF partnership aims at deploying highly efficient air conditioners, refrigerators, fans, electric motors and distribution transformers; Super-Efficient Equipment and Appliance Deployment (SEAD) from the CEM. IEA recommendation is to mandate minimum energy performance for appliances and after 2025 for all electrical plug-loads

Graph7 **Timeframe for reducing energy demand for appliances**



8 Reduced climate change-related risks for buildings: upgrade adaptation

In the context of the Sendai Framework for Disaster Risk Reduction, countries are engaged in taking measures to reduce disaster risks.

Climate and climate change affects construction in three ways: they have a relevant influence on construction delays and thus costs; as climate changes, buildings' and building materials' design standards will have to change in order to withstand the new weather conditions; as the pattern of natural disasters changes, a change in the demand for rebuilding and repair is implied[28].

Upgrading building durability and resilience of all buildings by gradually addressing the building stock. To reach this goal, the upgrade of the most critical infrastructures (e.g. having a social and economic relevance, like hospitals, emergency centers, schools, power plants, production and storage of hazardous products etc.) at first offers the best social value.

THE PROPOSED STEPS ARE FOR INSTANCE:

- **a** 100% of the existing and new critical infrastructures are better conceived by 2030;
- **b** 80% of the existing and new buildings have integrated risk and adaptation in their conception and maintenance by 2050.

QUICK WINS:

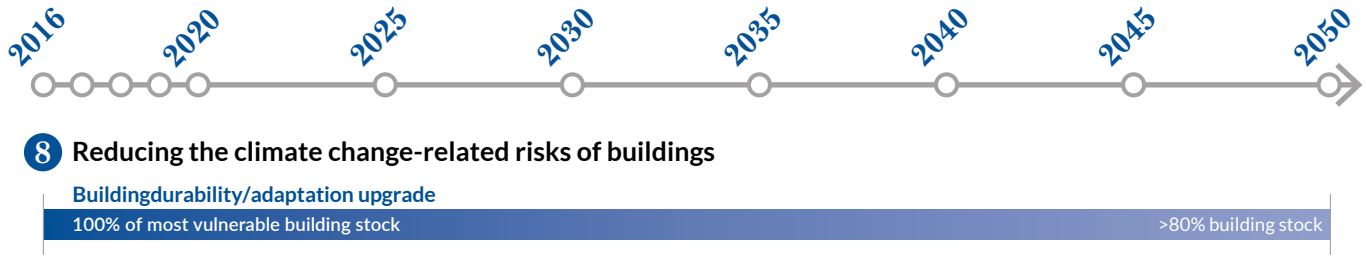
e.g. develop green and cool roofs. For instance, to prepare for more intense storms, some cities are using green infrastructure to capture rainwater before it can flood the combined sewer system, implementing green roofs, and elevating boilers and other equipment above ground[29].

In the case of new buildings, the implementation of urban planning rules integrating a risk approach (risk zoning) can prevent or lower the exposure to major climate risks.

28 *IPCC AR 5 Chapter 10 on Key Economic Sectors and Services: 10.5.2.2. Construction and Housing*

29 *Interalia [8.3.3, 26.3.3, 26.8.4] IPCC AR5 Technical summary*

Graph8 **Timeframe for reducing the climate change-related risks of buildings**



III. MEASUREMENT OF PROGRESS AND IMPACT

Once these steps with their sub measures are implemented (once again this approach is not prescriptive for countries, but a collective framework that can have different implementation strategies according to the needs and realities of each country), it is pivotal to the achievement of effective climate mitigation, to monitor, and report progress of measures and impact on building-related GHG emissions at all levels of government.

1 Measurement of progress

The Roadmap is based on 13 objectives using 15 indicators (see Annex 2), which will allow for progress to be tracked and for policy implementation to be monitored. Most of these indicators already exist in many countries, especially in the OECD. It is crucial that every country builds the capacity to improve available data and indicators.

Data availability: There is a growing need to monitor and report on energy efficiency due to the increasing level of energy efficiency policies and measures that are in place. The building sector is estimated to be the first sector to define and follow an international sectoral system of reporting. Many experiences of good practices and methodologies in reporting at national and international levels already exist (IEA, NEEAP in EU, UN-ECLAC).

2 Measurement of impact

Under the UNFCCC Climate Convention, states have to report their GHG emissions regularly according to the UNFCCC Common Reporting Framework (CRF).

Data availability: Most data needed to evaluate emissions from buildings (Scope 1, 2, 3) can be found in the UNFCCC inventories (CRF tables). Annex I Parties to the Convention have to report their national GHG inventories on an annual base, whereas Non-annex I Parties report them every 2 years (in their Biannual Update Reports and in their National Communications). Yet, these reports are not always available for every country. UNFCCC ensures that data are comparable between countries (via the use of IPCC guidelines) and reliable: Annex I Parties' inventories are subject to an annual technical review process, Non-annex I Parties' reports are addressed through the process of international consultation and analysis (ICA).

At local and sub-national level several methods exist. The Global Protocol for Community-Scale Greenhouse Gas Emission Inventories (GPC) proposes a standardized GHG emissions inventory framework employed in the carbonn Climate Registry for enhanced horizontal aggregation and vertical integration.

Proposal for UNFCCC CRF: As far as buildings are concerned, the GHG inventory only names emissions from buildings under the sections UNFCCC CRF 1.A 4 a and b, which are only buildings' direct emissions (Scope 1). To limit direct emissions to heating, hot water, cooling and lighting, detailed end-uses are needed, and indirect emissions need to assess the share of electricity and district heat for buildings

It will thus probably be necessary to reframe the UNFCCC CRF so that the data concerning the Scopes 2 and 3 are clearly identified, extracted and gathered together. Moreover, as the number of Near/Net-Zero buildings has to increase, a "Scope 0" might need to be added to the 3 Scopes framework, which will cover the self-made energy production that is consumed by the building itself.

GABC PROPOSAL FOR BUILDING-RELATED GHG EMISSIONS' INVENTORIES

Scope 0: self-energy production with no emissions

- on site electricity: photovoltaics, micro-wind turbine...
- on site heat: solar panels, heat pump, geothermal, biomass (impact on LULUCF)

Scope 1: direct emissions of the building sector (UNFCCC CRF 1. A 4 a and b)

- gas (fossil, bio, other)
- other fossil: fuel oil, coal
- F-Gas of heating and cooling system (Gas Montreal and Climate Convention)

Scope 2: indirect emissions of buildings in the energy sector (part of UNFCCC CRF 1. A 1 a)

- grid electricity (renewable and non-renewable)
- heat district (heating and cooling)

Scope 3: indirect emissions generated by [life cycle of] construction materials

- GHG emissions from major building materials manufactures sector (part of UNFCCC CRF 1 A 2 f energy + 2 A 1 process)
- LULUCF from wood consumption for buildings

IV. NEXT STEPS

This document presents the first draft of the Buildings and Construction Roadmap. It was prepared through input and discussions of the GABC in October 2016, distributed to all GABC members, and presented during the GABC Partner meeting on 09 November 2016 and at the Building Action Day at COP22 in Marrakech on 10 November 2016. The Roadmap will be periodically reviewed and updated by the GABC.

The Global Roadmap is accessible on the GABC website (www.globalabc.org)

V. GLOSSARY

Building envelope: the physical parts of a building that form the primary thermal barrier between interior and exterior (roof, ceilings, windows, exterior doors and walls).

Building-related energy: energy for heating, cooling, hot water, lighting and ventilation.

CDD: cooling degree day. Evaluation of annual cooling need.

COP (in energy): coefficient of performance

Energy in buildings: building-related energy + cooking, IT, domestic electrical goods.

Energy intensity: it is calculated by the ratio between energy consumption and GDP.

Global Alliance for Buildings and Construction (GABC): launched on the 3rd of December 2015 during the Building Day at COP21 in Paris, Le Bourget, by France and UN Environment*, GABC gathers together 23 countries and 70 partner organisations. The Alliance aims at supporting and accelerating the implementation of the NDCs, and thus facilitate the implementation of the Paris Agreement for the buildings and construction sector in terms of energy efficiency gains, growth of renewable energy and GHG emissions reduction. Moreover, the Alliance aims at dramatically reducing the GHG emissions of the global building stock by increasing the share of eco-friendly buildings, whether new or renovated.

HDD: heating degree day. Evaluation of annual heating need.

IEA: International Energy Agency.

IRENA: International Renewable Energy Agency.

ISO: International Standard Organisation.

ISO 14064: norms on GHG accounting and verification, published on the 1st of March 2006 by the International Standard Organisation.

LULUCF: Land Use, Land-Use Change and Forestry.

Montreal Protocol on Substances that Deplete the Ozone Layer (a protocol to the Vienna Convention for the Protection of the Ozone Layer): an international treaty designed to protect the ozone layer by phasing out the production of numerous substances that are responsible for ozone depletion. It was agreed on 26 August 1987, and entered into force on 26 August 1989.

NEEAP: National Energy Efficiency Action Plans are an obligation for EU countries under the Energy Efficiency Directive. EU countries must draw up these plans every three years and on this base they publish an annual report on their implementation.

Net-Zero Operating Emissions Building: a highly energy efficient residential or service building that produces on-site, or procures, enough carbon-free renewable energy to meet building operations energy consumption annually.

R (thermal resistance): evaluates the insulation factor of surfaces. Its unit is (m^2.delta temperature)/W .

Rebound effects as first described by William Stanley Jevons in 1865: economic gain coming from energy saving that triggers a new behaviour generating new energy consumption (e.g. better thermal insulation can lead to a raise of indoor comfort temperature level).

Renovation rate: renovated building surface divided by total not renovated building stock surface (in m^2 or equivalent residential unit).

U (thermal transmittance co-efficient): the opposite of R. It measures the flow of energy passing through a structure (expressed in W/(m^2.delta temperature). It can evaluate the global needs of the building envelope.

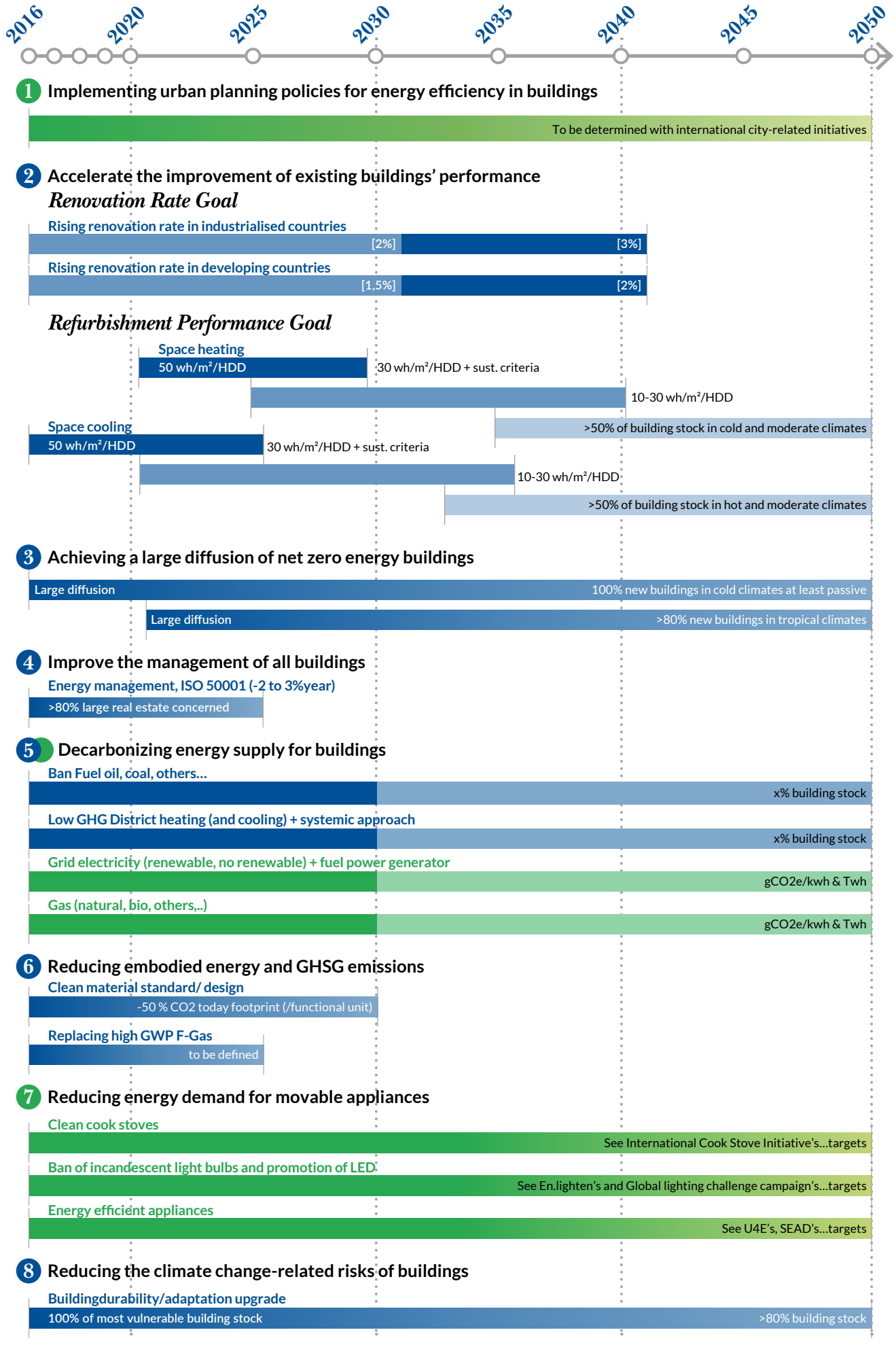
UN-ECLAC: United Nations Economic Commission for Latin American and the Caribbean.

UNFCCC: United Nations Framework Convention on Climate Change.

ANNEX 1 – TIMEFRAME OF THE GLOBAL ROADMAP'S STEPS

Colour code of the graphs:

- *GOALS OF THE ROADMAP*
- *REMINDER OF GOALS ADDRESSED BY OTHER SECTORS/COMMUNITIES*


2016
2020
2025
2030
2035
2040
2045
2050
1 Implementing urban planning policies for energy efficiency in buildings
To be determined with international city-related initiatives
2 Accelerate the improvement of existing buildings' performance
Renovation Rate Goal
Rising renovation rate in industrialised countries
[2%]
[3%]
Rising renovation rate in developing countries
[1,5%]
[2%]
Refurbishment Performance Goal
Space heating
50 wh/m²/HDD
30 wh/m²/HDD + sust. criteria
10-30 wh/m²/HDD
>50% of building stock in cold and moderate climates
Space cooling
50 wh/m²/HDD
30 wh/m²/HDD + sust. criteria
10-30 wh/m²/HDD
>50% of building stock in hot and moderate climates
3 Achieving a large diffusion of net zero energy buildings
Large diffusion
100% new buildings in cold climates at least passive
Large diffusion
>80% new buildings in tropical climates
4 Improve the management of all buildings
Energy management, ISO 50001 (-2 to 3%year)
>80% large real estate concerned
5 Decarbonizing energy supply for buildings
Ban Fuel oil, coal, others...
x% building stock
Low GHG District heating (and cooling) + systemic approach
x% building stock
Grid electricity (renewable, no renewable) + fuel power generator
gCO2e/kwh & Twh
Gas (natural, bio, others,..)
gCO2e/kwh & Twh
6 Reducing embodied energy and GHSG emissions
Clean material standard/ design
-50 % CO2 today footprint (/functional unit)
Replacing high GWP F-Gas
to be defined
7 Reducing energy demand for movable appliances
Clean cook stoves
See International Cook Stove Initiative's...targets
Ban of incandescent light bulbs and promotion of LED
See En.lighten's and Global lighting challenge campaign's...targets
Energy efficient appliances
See U4E's, SEAD's...targets
8 Reducing the climate change-related risks of buildings
Buildingdurability/adaptation upgrade
100% of most vulnerable building stock
>80% building stock

ANNEX 2 – SUMMARY OF OBJECTIVES AND INDICATORS

Goals	*Suggested Targets & Dates*	*Accounting Units*
	Based on Existing Data or Indicators	
Improvement of existing buildings' performance	Close to zero emissions from today's existing buildings at least by 2070	Petajoules
Renovation rate goal for industrialized countries	2% on average of the existing stock by 2025 and 3% by 2040	% of renovation of stock, but what is called renovation (in meter square? Only deep and total renovation?)
Achieving a large uptake of net-zero energy buildings before 2025 in cold and intermediate climates	100% new buildings in cold climates at least passive by 2025	Operating emissions, in %
Decarbonizing energy supply for buildings	% of building stock with high GHG fuels; % of building stock with low GHG district heating/cooling; CO_2 content and total consumption of electricity and gas	% building stock & gCO_2e/ kwh&Twh
	Reachable Indicators	
Renovation rate goal for developing countries	1,5% on average of the existing stock by 2025 and 2% by 2040	%
Performance goal for space heating after refurbishment	From 50 wh/m^2/HDD in 2020 to 30 wh/m^2/HDD + sust. Criteria in 2030, to 10-30 wh/m^2/HDD in 2040	wh/m^2/HDD* or CDD* + sustainability criteria according to cold/hot climate
Performance goal for space cooling after refurbishment	From 50 wh/m^2/HDD today to 30 wh/m^2/HDD + sust. Criteria in 2025, to 10 wh/m^2/HDD in 2035	idem
Achieving a large uptake of net-zero energy buildings before 2030 in hot and intermediate climates	>80% new buildings in tropical climates by 2030	Operating emissions, in %
Energy management goal	Energy reduction of 2% to 3% per year or 20% to 30% by 2025, with the aim to cover 80% of large real estate by 2025	% energy consumption
Energy management goal	Achieving 100% energy metering of delivery point or energy control in service building by 2030, achieving 30% energy savings of the new controlled energy	% energy delivery point, % service building
Replacing high GWP F-Gas	tbd	
Reducing the climate-change- related risks of buildings	100% of most critical building infrastructure by 2030, >80% of building stock upgraded in terms of building durability/adaptation by 2050	% of most critical building infrastructure, % of the building stock
	More Difficult Indicators if not Limited to Main Products	
Reducing embodied energy and GHG emissions	-50% CO_2 today footprint	tbd

ANNEX 3

Kaya identity: an equation relating factors that determine the level of human impact on climate, in the form of emissions of the CO_2. If we adapt the Kaya identity to the building sector, we would have as follows:

CO_2 = population x (social needs/population) x (energy/social needs) x (CO_2/Energy)

When the population and the social needs increase, the first step to stabilise and decrease GHG emissions is to dramatically reduce the energy used to cover these needs by investing in energy efficiency. This will trigger the reduction of the investments needed to provide energy as well as the annual energy costs for the population.

» ACKNOWLEDGEMENTS

We thank the following GABC focal points and supports for their inputs to this Roadmap

Ms. Sylvie Lemmet, Director International and European Affairs, French Ministry of Environment, Energy and Sea & Ministry of Sustainable Housing

Ms. Stefanie Greil, PhD, II-C 1 General Issues of Energy Policy in the Buildings Sector Federal, Ministry for Economic Affairs and Energy Federal (BMWi)

Mr. Frederic Auclair, GABC coordinator, UN Environment

Mr. Brian Dean, Energy Efficiency, International Energy Agency

Mr. John Dulac, Energy Analyst, Energy Technology Policy Division, International Energy Agency

Mr. Pascal Eveillard, Marketing, Strategy and Sustainable Development, Saint-Gobain

Mr. Nils Larsson, Executive Director of the International Initiative for Sustainable Built Environment (IISBE)

Mr. Regis Meyer, Ing, Climate Change Unit, French Ministry of Environment, Energy and Sea & Ministry of Sustainable Housing

Ms. Iris Nicomedi, Intern from Sciences Po Paris, French Ministry of Environment, Energy and Sea & Ministry of Sustainable Housing

Mr. Alejandro Treviño Díaz, Secretario Técnico, Dirección General de Desarrollo Urbano, Suelo y Vivienda, SEDATU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UN environment

Global Alliance for Buildings and Construction

REPORT TO THE EXECUTIVE COMMITTEE
From Foundation Board of Trustees
As of (06/26/2017)

Recommendations for ExCom Approval:

1. Foundation Board of Trustees recommends to the ASHRAE Board of Directors to change the name of the "ASHRAE Foundation Learning Center" to the "Carolyn and Damon Gowan Learning Center."

   Background: At the time that Damon Gowan gave the original gift in support of the Learning Center, he wanted to remain anonymous. However, given his unwavering service at this point of his tenure with ASHRAE, the Foundation Board of Trustees believes it is proper to honor him and his wife by naming the center the "Carolyn and Damon Gowan Learning Center." Damon has agreed to accept this honor.

   Fiscal Impact: None.

Information Items:

1. The Nominating Committee presented a slate of Trustee nominees for consideration for SY 2018-19. After some discussion, the following names were approved to go forward to the SY 2017-18 President Elect.

   For Board of Trustees
   Damon Gowan
   Dan Pettway
   Richard Hayter
   Jeff Clarke
   Don Colliver
   Joe Noworatzky – Corporate Representative from Carrier
   Larry Kouma – Corporate Representative from Johnson Controls

   For Alternates
   Bill Bahnfleth
   John Harrod
   Rich Rose

2. The Foundation Board of Trustees approved splitting the Lynn Bellenger Scholarship Fund 343 into two separate funds. One fund will be named the Lynn Bellenger Undergraduate Engineering Scholarship and the second fund will be named the Lynn Bellenger Engineering Technology Scholarship. Both of these scholarships have a different application deadline and are awarded at different times throughout the year.

3. The Foundation Board of Trustees refers an item to the Scholarship Trustees to revise the wording of section 3.2.4 of the ASHRAE Scholarship Program Guidelines to delete the wording "ASHRAE Headquarters interest bearing account" and substitute "ASHRAE Foundation account."

4. The Foundation Board of Trustees approves the establishment of the ASHRAE Houston Chapter Richard W. Burr Scholarship Fund. The purpose of the Houston Chapter Scholarship is to provide scholarship funds to students that want to enter the HVAC Industry and to honor Richard W Burr, Past President of the Houston Chapter of ASHRAE (1980-81).

   Fiscal Impact: $30,000 the scholarship will be fully funded by July 01, 2017.

5. The Foundation Board of Trustees amended the motion to approve the establishment of the ASHRAE Johnstown Chapter Scholarship Fund to include “J Thomas and Linda Sobieski” in the name of the fund.

June 27, 2017

Date

Chair

REPORT TO THE EXECUTIVE COMMITTEE
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As of (06/26/2017)

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June 27, 2017

Date

Chair

REPORT TO THE EXECUTIVE COMMITTEE
From Scholarship Trustees
As of June 27, 2017

Recommendations for ExCom Approval:

1. The Scholarship Trustees recommend Executive Committee approve the Ottawa Valley Scholarship as proposed in the attached signed endowed gift agreement between ASHRAE's Ottawa Valley Chapter and ASHRAE Foundation with criteria listed in the Purpose section of the agreement. (Attachment A)

Information Items:

1. The Scholarship Trustees approved the following referral motion to Members Council:

   Referral Motion 1 to Members Council from Scholarship Trustees:
   To investigate the feasibility of a partnering relationship between the Scholarship Trustees and ASHRAE Regions XII, XIII, and RAL for the purpose of developing and administering micro-scholarships in the amount of $200 each for undergraduate engineering students in countries with developing economies.

2. The Scholarship Trustees are currently reviewing their Guidelines and MOP in an ongoing effort to update and consolidate information. The Trustees approved revisions to the Scholarship Guidelines, which are being reviewed concurrently by the Society Rules Committee for continued compliance with the Society's Rules of the Board. The Scholarship Trustees plan to send all approved Guidelines and MOP revisions to ExCom with a recommendation for approval by the ASHRAE Board of Directors at the 2018 ASHRAE Winter Conference in Chicago. Due to the extensive nature of the revisions, the scholarship trustees plan to distribute a draft of both documents to ExCom for a preliminary review at the fall 2017 meeting.

3. The Scholarship Trustees awarded the Society's High School Senior, Freshman, and Engineering Technology Scholarships for the 2017-2018 academic year as follows:

   High School Senior Scholarship - $3,000 each
   Nicholas Koch, University of Dayton, Mechanical Engineering Technology
   Joshua Fox, Pennsylvania College of Technology, HVACR Design & Technology
   Thomas Guilfoil, State University of New York at Canton, Air Conditioning Engineering Technology
   Esteban Garcia Ponte, Clemson University, Engineering

   Freshman Scholarship - $5,000
   Tyler McCubbins, University of Tennessee, Mechanical Engineering

   Lynn G. Bellenger Engineering Technology Scholarship - $5,000
   Justine Labrador, Ferris State University, HVACR Technology & Energy Management

   Engineering Technology Scholarship - $5,000 each
   Justin Dean, Ferris State University, HVACR Technology
   John Gisonna, Pennsylvania College of Technology, HVACR Design Technology
   Lakshya Garg, Purdue University, Network Engineering Technology

4. The Scholarship Trustees approved changing the annual application deadline for Engineering Technology Scholarships from May 1st to December 1st. The reason for the change is to accommodate donors who wish to endow one scholarship for either an undergraduate engineering or engineering technology student. Currently the Scholarship Trustees review applications of Engineering students at the ASHRAE Winter Conference and Engineering Technology students at the Annual Conference.

5. The Trustees elected Darin Nutter as Chair and Jeff Gatlin as Vice Chair of the Scholarship Trustees for the 2017-2018 Society Year.

_____ _____

Date Chair

Attachment A
Scholarship Report to ExCom
June 27, 2017

ENDOWED GIFT AGREEMENT BETWEEN
OTTAWA VALLEY CHAPTER OF ASHRAE
AND
ASHRAE FOUNDATION, INC.

This Agreement is between the **Ottawa Valley Chapter of ASHRAE** (Donor) and **ASHRAE Foundation, Inc.** (The Foundation), located in Dekalb County Georgia, on behalf of and for the benefit of the American Society for Heating, Refrigerating & Air Conditioning Engineers (ASHRAE). In accordance with the Foundation's tax exempt status, the gift will be placed in endowment and used for the stated purpose.

1. **Pledge**

The Donor, in consideration of an abiding interest in ASHRAE and for support of the Society, pledges to ASHRAE Foundation the amount of $60,000 Canadian Dollars (Total Gift) subject to the provisions below to be paid via multi-year installments as follows: The Total Gift will be paid to the ASHRAE Foundation in a period of five years, with the first installment of $5,000 Canadian Dollars to be paid on or by December 31, 2016. Future installments will be paid annually to fulfill this pledge until it is complete according to the following payment schedule:

$25,000 Canadian dollars by June 30, 2017;

$15,000 Canadian dollars by June 30, 2018;

$10,000 Canadian dollars by June 30, 2019;

$5,000 Canadian dollars by June 30, 2020

Donor understands that the first scholarship under this agreement may not be awarded until at least one year following receipt of the Total Gift. In the event that the pledge for the Total Gift is not fulfilled by December 31, 2021, then this Agreement may be terminated and the fund balance and any unspent earnings may be transferred to an undesignated fund and used for a purpose as closely related to the original purpose as possible, keeping in mind the original intent of the Donor.

The Foundation will hold the Total Gift together with any other properties that may later be brought within the operation of this Agreement, for the purposes described in this Agreement.

The Foundation and Donor agree that the Donor and others have the right to make additional donations, either by gift or bequest, to be added to the Donor's Total Gift at the Foundation for

the purposes outlined by this Agreement. Any such additional donations shall not in any way alter the purposes outlined in Section (2) below.

2. **FUND**

The Ottawa Valley Scholarship Endowed Fund is to encourage local university and college students to pursue studies that will qualify them for employment in the heating, refrigeration and air conditioning industry.

A. Scholarships are available to full-time undergraduate mechanical, architectural, sustainability, or building science engineering or engineering technology students enrolled in a program leading to a professional degree or advance diploma in a field of study that has traditionally been a preparatory curriculum for the HVAC&R profession. Applicants must have a class standing of no less than the top 30% and meet at least one of the following criteria:

   - the institution hosts a recognized ASHRAE student branch or
   - the program is accredited by Engineers Canada, a signatory of the Washington Accord or the Canadian Council of Technicians and Technologists (CCTT), a signatory of the Sydney Accord.

B. Applications will only be accepted from institutions within the National Capital Region that meet the criteria above. The following institutions have demonstated compliance:
   1. Carleton University (Ottawa, ON)
   2. University of Ottawa (Ottawa, ON)
   3. Algonquin College (Ottawa, ON)
   4. Cegep de L'Outaouais (Gatineau, QC)

C. Applications and all supporting documents must be in English.

The Donor agrees to follow the ASHRAE "Scholarship Program Guidelines". The Donor should be advised of any proposed changes to these guidelines. All eligible applicants must meet the Society's general criteria for an Undergraduate Engineering or Engineering Technology Scholarship. Pursuant to ASHRAE Foundation's spending policy for each fiscal year, as determined by the ASHRAE Foundation Trustees after considering the factors described in the Official Code of Georgia Section 44-15-4(a), 1-7, the applicable earnings portion of the Fund each year shall be used to support a deserving Engineering undergraduate student through the award of a scholarship. This amount is determined upon approval of the Foundation Trustees. As of the date of this agreement, the Foundation's spending policy is 5% of the Donor's Total Gift in Canadian dollars.

3. **Administration**

The Foundation will manage the Fund in accordance with its financial management policies by the Board of the Foundation and use the Total Gift only to support the purpose outlined in Section (2). The Society Scholarship Trustees will select scholarship recipient.

4. **Changed Circumstances**

It may be that at some future time it becomes impossible or impracticable, as decided by the Board of the Foundation, for all or part of the Ottawa Valley Chapter Scholarship to be used for the specific purpose set forth above. The Board of the Foundation shall recommend that the principal and income of the Fund be devoted to purposes that it deems to be most consistent with the wishes and intentions of the Donor. This proposed redirection of funds shall only be allowed with the approval of the sitting Ottawa Valley Chapter Board of Governors at that time.

5. **Recognition**

Donor here agrees that the Total Gift may be noted in future ASHRAE Foundation and ASHRAE Society publications.

In witness whereof, the Donor and the Foundation have executed this Agreement on the dates indicated below.

Abbey Saunders — 29 Dec 2016

Name ABBEY SAUNDERS
Ottawa Valley Chapter of ASHRAE
Chapter President

Date

Mr. Jeff Littleton, Secretary
ASHRAE Foundation, Inc.

2/10/17
Date

Kim Mitchell, Chief Development Officer

2/15/17
Date

REPORT TO THE EXECUTIVE COMMITTEE
From __College of Fellows____
As of June 25, 2017

Recommendations for ExCom Approval:

1. The College of Fellows approved the attached Manual of Procedures and recommends approval by the Board of Directors ExCom. (Attachment A)

Background:
The changes are to reflect the motion passed at the 2017 Winter Meeting to increase the terms for officers from one year to two years.

Information Items:

1. The College of Fellows supports the relationship between ASHRAE and AIA and would like to encourage Board ExCom to become more involved with AIA. See the attached document showing the support from the Fellows. (Attachment B)

2. Mentoring
The mentoring provided by the COF for YEA is not a success from the 10027 YEA members only 51 have signed up.

3. Honors and Awards
The COF and Honors and Awards have agreed to have two Fellows involved in reviewing Fellow nominations.

6-28-2017
Date

President, Peter Simmonds

Shaping Tomorrow's
Built Environment Today

Manual of Procedures (MOP)
College of Fellows (COF)
Effective July 1, 2018

Forward

The College of Fellows is a General Standing Committee of the Society and operates under the direction of the Board of Directors. The Rules of the Board (ROB) are the constitution of the committee. Proposed changes to the ROB and their appendices must be approved by the Board of Directors.

This Manual of Procedures (MOP) describes the methods and procedures by which the committee accomplishes the duties and responsibilities assigned to it. The MOP is an internal document of the committee for its own guidance. The MOP and revision thereto, shall be submitted to the Board of Directors for approval.

Proposed MOP and ROB changes shall normally only be presented to the Board of Directors for approval once a year for consideration.

Contents

1.0 College of Fellows – General

1.1. Scope

1.1.1. To serve as ambassadors to enhance ASHRAE's technical image internally and in the community at large through activities such as transferring ASHRAE-generated technology and knowledge

1.2. Purpose

1.2.1. To mentor students, engineers, and educators to increase their awareness of ASHRAE activities

1.2.2. To share knowledge or experience with the grassroots organization, such as chapter presentations

1.2.3. To communicate ASHRAE recommended practices to resolve current industry problems

1.2.4. To support ASHRAE governance in conducting special technical activities

1.3. Membership

1.3.1. Each person who is a Fellow of ASHRAE and is in good standing in the Society shall have the status of member of the College of Fellows (COF).

1.3.2. The rights and privileges of membership shall be personal to the member and shall not be delegated or transferred.

1.3.3. A member of the COF may resign at any time by giving prior written notice of resignation to the COF President. The rights and obligations of membership cease upon the death of the member or when the member ceases to be a member of ASHRAE.

1.4. Meetings

1.4.1. Regular COF meetings shall be scheduled during the Society's Annual [summer] and Winter Conferences.

1.4.2. They shall be called by the COF President or, in their absence, by the COF President-elect.

1.4.3. Notices of meetings shall, when possible, be published in the preliminary and/or the official program of the Society conferences. At the discretion of the COF President, notices of meetings may be sent directly to COF Members.

1.4.4. Except as otherwise provided in this Section, the COF President shall preside at every COF meeting (and any adjournment thereof).

1.4.4.1. If the COF President is absent, unable or unwilling to serve, the COF President-elect shall preside at the meeting.

1.4.4.2. If neither the COF President nor the COF President-elect is present and willing to serve as chairman of the meeting, and if the COF President has not designated another person who is present and willing to serve, then a majority of the Executive Committee members present at the meeting shall to designate a person to serve as chairman of that meeting.

1.4.4.3. The Chair of the meeting may designate other persons to assist with the meeting.

1.5. Adjournments.

1.5.1. At any meeting of members (including an adjourned meeting), a majority of members present and entitled to vote at the meeting (whether or not those members constitute a

quorum) may adjourn the meeting to reconvene at a specific time and place. The only business that may be transacted at any reconvened meeting is business that could have been transacted at the meeting that was adjourned, unless further notice of the adjourned meeting has been given in compliance with the requirements for a special meeting that specifies the additional purpose or purposes for which the meeting is called. Nothing contained in this Section shall be deemed or otherwise construed to limit any lawful authority of the chairman of a meeting to adjourn the meeting.

1.6. Conduct of the Meeting.

1.6.1. At any meeting of COF members or COF ExCom, Robert's rule of order governs the conduct of business at the meeting.

1.7. Action of Members without a Meeting.

1.7.1. For an action to be taken without a meeting, an electronic or written ballot shall be made available to every member entitled to vote. Such ballot shall:

1.7.1.1. set forth each proposed action,

1.7.1.2. provide an opportunity to vote for or against each proposed action, and

1.7.1.3. provide a space for the member to sign.

1.7.1.4. All solicitations for votes by electronic or written ballot shall

1.7.1.4.1. indicate the number of responses needed to meet the quorum requirements;

1.7.1.4.2. state the percentage of approvals necessary to approve each matter; and

1.7.1.4.3. specify the time by which a ballot must be received by the COF in order to be counted, which time must be no less than two weeks after sending the ballot.

1.7.1.4.4. Approval by electronic or written ballot shall be valid only when the number of votes cast by ballot equals or exceeds the quorum required to be present at a meeting authorizing the action, and a majority of the votes are for approval. The action must be evidenced by electronic or written ballots describing the action taken, signed by members, and delivered to the COF for inclusion in the minutes.

1.8. Special Meetings

1.8.1. Special meetings of members may be called at any time by the COF ExCom or the COF President, or upon the written request of COF members representing ten percent (10%) or more of the votes entitled to be cast on each proposed issue to be considered at the special meeting.

1.8.2. The business that may be transacted at any special meeting of members shall be limited to that proposed in the notice of the special meeting

1.8.3. Notice of a special meeting must be given no fewer than ten (10) days nor more than sixty (60) days before the meeting date to each member of record entitled to vote at the meeting. The notice of a special meeting shall include a description of the matter or matters for which the meeting is called as well as the date, time and location of the meeting. If the meeting is to be electronic, instructions for joining must also be included.

1.9. Quorum

1.9.1. The COF President shall establish the quorum for a meeting of the COF members as those Fellows who are present but not less than 10. For an electronic or written ballot, the COF President shall establish the quorum as the total of those returning ballots but not less than 10.

1.9.2. At all meetings of COF members, any members entitled to vote on a matter may take action on the matter only if a quorum of the members exists at the meeting.

1.9.3. Once a member is present at any meeting other than solely to object to holding the meeting or transacting business at the meeting, the member shall be deemed present for quorum purposes for the remainder of the meeting and for any adjournments of that meeting; unless a new record date for the adjourned meeting is or must be set.

2.0 Officers

2.1. The officers of the COF shall consist of a COF President, a COF President-elect and a COF Secretary/Treasurer, each of whom shall be first nominated by the COF Nominating Committee and then elected by the members at an annual meeting of the COF members. Two or more offices may not be held by the same person.

2.2. Term of Office

2.2.1. The COF officers shall serve a single two-year term commencing on the first day of the COF's fiscal year following election to office.

2.2.2. The COF President-elect shall succeed to the office of COF President upon completion of their term as COF President-elect. Normally the COF President-elect shall be selected from the COF Secretary/Treasurer who has completed their two year term.

2.2.3. If the office of COF President becomes vacant, the COF President-elect shall immediately succeed to the un-expired term of the COF President and, on completion of that term, shall continue to serve as COF President for a full two-year term. In the special case where the office becomes vacant before the first meeting after the election, the COF President-elect will be considered to have started their two year term upon elevation to the office of COF President. The COF Secretary/Treasurer shall be elevated to the position of COF President-elect and section 2.2.4 will be implemented.

2.2.4. In the event that the office of the COF President-elect, COF Secretary/Treasurer or immediate past COF President becomes vacant, cannot fulfill the duties of the office or is removed, the remaining members of COF ExCom shall appoint a member of the COF to serve during the remaining year. A special election to permanently fill the position shall be scheduled for the Annual meeting. The last constituted nominating committee shall be charged with providing the candidate(s).

2.2.5. All officers shall remain in office until their successors are duly elected

2.3. Removal. Any COF officer (regardless of how elected or appointed) may be removed with cause by Society's Board of Directors

2.4. COF President.

2.4.1. The COF President shall preside at and serve as Chair of COF meetings and shall perform other duties and have other authority as may from time to time be delegated by Society's Board of Directors. The COF President has the authority to appoint COF committees as needed.

2.5. COF President-elect.

2.5.1. The COF President-elect shall, in the absence or disability of the COF President, or at the direction of Society's Board of Directors, perform the duties and exercise the powers of the COF President. The COF President-elect shall perform any other duties and have any other authority as from time to time may be delegated by the COF President or COF Board of Directors.

2.6. COF Secretary/Treasurer.

2.6.1. The COF Secretary shall be responsible for preparing minutes of COF meetings. The COF Secretary shall perform any other duties and have any other authority as from time to time may be delegated by the COF President or COF ExCom.

2.6.2. Unless otherwise provided by the COF Board of Directors, the COF Treasurer, in conjunction with the Society's financial officer, shall be responsible for overseeing of all funds and securities belonging to the College of Fellows and for the receipt, deposit, or disbursement of these funds and securities under the direction of the Board of Directors. The COF Treasurer shall cause full and true accounts of all receipts and disbursements to be maintained and shall make reports of these receipts and disbursements to the Society Board of Directors and President upon request. The COF Treasurer shall perform any other duties and have any other authority as from time to time may be delegated by the COF President or COF ExCom.

3.0 Executive Committee (COF ExCom)

3.1. The number of members of the COF ExCom shall be fixed at five (5).

3.1.1. The COF President, COF President-elect and the COF Secretary/Treasurer, plus the immediate past COF President and a COF member-at-large, shall comprise the COF Executive Committee (COF ExCom).

3.1.2. Except in case of death, resignation, disqualification, or removal, each COF ExCom member shall serve for a term coincident with their term of office. Despite the expiration of a COF ExCom member's term, he or she shall continue to serve until a successor has been elected and has qualified.

3.1.3. COF ExCom members must be members of the ASHRAE College of Fellows in good standing.

3.2. COF ExCom shall report to Society's Board of Directors and members of the COF at each of its meetings.

3.3. General Powers. All business and affairs of the COF shall be managed by its Executive Committee (COF ExCom).

3.4. Committees of COF ExCom.

3.4.1. COF ExCom shall appoint a nominating committee of at least five (5) members, including the immediate past COF President, to propose a slate of officers and a COF member-at-

large for election by COF members to serve a two year term on COF ExCom. Except for the immediate past COF President who will serve as Chair, no member of COF ExCom may serve as a member of the nominating committee.

3.4.2. COF ExCom may designate one or more standing or ad hoc committees, each consisting of one or more COF members, who serve at the pleasure of COF ExCom.

3.5. Regular Meetings.

3.5.1. A regular meeting of COF ExCom shall be held in conjunction with each meeting of members.

3.6. Special Meetings.

3.6.1. Special meetings of COF ExCom may be called by or at the request of the COF President or any COF ExCom member in office at that time.

3.7. Place of Meetings.

3.7.1. COF ExCom may hold their meetings in conjunction with Society Annual and Winter Conferences.

3.8. Quorum.

3.8.1. At COF ExCom meetings, a majority of the COF ExCom members then in office shall constitute a quorum for the transaction of business.

3.9. Vote Required for Action.

3.9.1. If a quorum is present when a vote is taken, the vote of a majority of the COF ExCom members present at the time of the vote will be the act of COF ExCom. A COF ExCom member who is present at a meeting when action is taken is deemed to have assented to the action taken unless

3.9.1.1. he or she objects at the beginning of the meeting (or promptly upon arrival) to holding the meeting or transacting business at it;

3.9.1.2. his or her dissent or abstention from the action taken is entered in the minutes of the meeting; or

3.9.1.3. he or she delivers written notice of dissent or abstention to the presiding officer of the meeting before its adjournment or to the COF immediately after adjournment of the meeting. The right of dissent or abstention is not available to a COF ExCom member who votes in favor of the action taken.

3.10. Participation by Conference Call.

3.10.1. Members of COF ExCom may participate in a COF ExCom meeting by means of conference telephone or similar communications equipment through which all persons participating may hear and speak to each other. Participation in a meeting pursuant to this Section shall constitute presence in person at the meeting.

3.11. Action by COF ExCom without a Meeting.

3.11.1. Any action required or permitted to be taken at any meeting of COF ExCom may be taken without a meeting if an electronic or written consent, describing the action taken, is signed by each COF ExCom member and delivered to the COF for inclusion in the minutes of the next meeting. The consent shall have the same force and effect as a unanimous vote of COF ExCom at a duly convened meeting.

4.0 Voting

4.1. Voting Rights.

4.1.1. In all matters that call for the vote of members, each member shall have one vote. Each member shall be entitled to vote in the election of members of COF ExCom and in any other matter that requires the vote of members.

4.2. Proxies.

4.2.1. A member entitled to vote on a matter may vote in person or by proxy pursuant to an appointment executed in writing by the member or by his attorney-in-fact. An appointment of a proxy shall be valid for eleven (11) months from the date of its execution, unless a longer or shorter period is expressly stated in the proxy.

5.0 Fiscal

5.1. Approval of expenditures of College of Fellows funds

5.1.1. By majority vote of the COF Executive Committee (COF ExCom) as prescribed in section 3.

5.1.2. By majority vote of the members present at a regular meeting, provided that there are at least 5 voting members physically present at the time of the vote

5.1.3. Disbursements of up to $1000.00 may be approved by the COF Secretary/Treasurer (or in his absence, any other COF officer) in writing or by E-mail. Disbursements exceeding $1000.00 shall require the additional approval of the COF President or another COF officer

6.0 Staff Liaison

6.1. A staff liaison shall be provided by ASHRAE.

7.0 Revisions

7.1. Revisions to the Manual of Procedures may be initiated by any three (3) members of COF ExCom or by six (6) members of the COF and must be submitted in writing to COF ExCom with signatures.

7.2. All such revisions, if approved by three (3) or more members of COF ExCom, shall be submitted for vote at the next COF meeting.

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Topic: to encourage more involvement with the AIA

Background

There are approximately 140,000 Architects in the US and around 2 million in the global building design and construction market. Architects are traditionally the prime design professional who coordinates the work of most of the engineering disciplines for most new construction and major renovation design work.

ASHRAE has approximately 57,000 members of which there are 18,000 Consulting Engineers, 9,000 Contractors and some 5,000 Manufacturers and Manufacturers Representatives. These three classes of members represent about 57% of our membership and much of the services they provided are directly for Architects.

Architects design buildings, they need ASHRAE Engineers to provide design assistance and analysis to design their building enclosures and to manufacture, design and construct the Mechanical Systems in the buildings they design.

ASHRAE has a Memorandum of Understanding with the AIA. However, we encourage ASHRAE to provide more opportunities at the summer and winter meetings and at our specialty conferences to focus on the benefits of the interaction between Mechanical Engineers and Architects, integrated design and integrated project delivery and to increase attendance and participation of AIA members at our meetings and on our technical and standards committees and vice versa with ASHRAE members participating in and offering educational presentations and sessions at AIA local and national conferences and chapter meetings..

ASHRAE have strong, formal liaison networks with CIBSE, AHRI, SMACNA, DOE, NIBS, and others.

Proposal

We encourage ASHRAE to set up a solid, working liaison group with AIA – especially with the AIA conferences committees, continuing education committees and with their “Knowledge Community.” ASHRAE would be represented at AIA conferences, providing ASHRAE Learning courses for the Architects. ASHRAE Standard 90.1 is used as the calculation tool for the AIA 2030 challenge, yet no instruction is given to AIA on this subject. AIA members will be encouraged to attend ASHRAE meetings at both society and chapter levels, as well as ASHRAE members attending AIA events.

The College of Fellows strongly advises the Leadership of ASHRAE to construct a path to mold the interests of both societies toward more integrated design and construction best practices.

The Advantage for ASHRAE and its members is tremendous and we such not let the opportunity be ignored. To be included in the new Strategic plan.

Signed

The College of Fellows

June 2017

REPORT TO THE BOARD OF DIRECTORS
From the Life Member's Club Executive Committee
Meeting of June 27, 2017

RECOMMENDATIONS FOR VOTE:

None.

INFORMATION ITEMS:

1. The year to date giving is up from this time last year.
2. The Life Member's Club will have Dick Wittkop come speak at the Life Member's Luncheon. He will be talking about the Port of Long Beach.
3. The Life Member's Executive Committee discussed ideas for reaching out to Life Members outside of the US and Canada.

Rick Hayter

6/27/2017

Date

Chair

REPORT TO THE EXECUTIVE COMMITTEE
From ASHRAE/AHRI Joint Exposition Policy Committee
May 10, 2017

Information Items:

1. A final attendance report of the 2017 AHR Expo in Las Vegas reveals several new all-time records for the Show, including 500,159 net square footage of exhibit space. Attachment A.

2. A comparison of ASHRAE Winter Conference registrations from 2008 to 2017 reveal higher attendance rates when the AHR Expo is held in Las Vegas as compared to other cities. Attachment B.

3. The committee discussed the future direction of the AHR Expo based on current concerns that there are a limited number of cities that have enough space to support the growth of the Show in square footage. It was the consensus of the committee that quality of the Show and value to its exhibitors and visitors is more important than increasing size of the Show to more than 550,000 square feet in the foreseeable future.

4. The committee discussed the importance of having someone from ASHRAE be a permanent member of the committee, who could provide continuation of ideas and action similar to the AHRI model. It was the consensus of the committee to recommend that the ASHRAE President appoint Jon Cohen as a consultant to the committee on an on-going basis.

5. Scheduling the Show is becoming more difficult
    - Many of our exhibitors are from Asia and scheduling our Show in conflict with the Chinese New Year (CNY) poses a significant problem for the exhibitors and attendees from the region. AHRI has taken a position that future shows must not be scheduled to conflict with the CNY. The committee agrees with this position and is scheduling the Show to avoid the CNY
    - The success of the Show limits the number of venues that we can use. If we need more than 500,000 rentable sq. ft. of exhibit space, we can use halls in Chicago, Las Vegas, Orlando and Atlanta. These large halls are booked years in advance with recurring shows that are difficult to move.
    - The above factors have resulted in the committee approving dates that are later than normal. In 2025 we are working to reserve dates of February 24 – 26. In 2026, we are trying to reserve space in Atlanta for February 23 – 25.

6. Future AHR Expos – Attachment C

A. 2018 – Chicago, January 22-24

- 500,005+ sq. ft. of exhibition space has been sold with additional space available for a maximum of 530,000 sq. ft.
- 1,561 exhibiting companies, which is expected to increase due to the addition of co-exhibitors and more space sales.

B. 2019 – Atlanta, January 14-16

IEC is working on the floor plans and with the convention bureau for hotel space. A total of 540,000 sq. ft. of exhibitor space is available. Currently, the B & C halls are being held. It was noted that the exhibit space in Dallas is not large enough to hold the Show.

The committee approved an exhibitor space rate of $39.90 per sq. ft. for the show in 2019 as recommended by IEC. A formula based on the CPI is used to determine the rate.

C. 2020 – Orlando, February 3-5

Over 500,000 sq. ft. of exhibit space available in the Convention Center's West building, which is connected to hotels. The West building has more meeting space and food areas than the North/South building, which is not available.

7. AHR Expo Mexico – Attachment D

A. The 2017 AHR Expo Mexico, held in Monterrey, received the following two awards from the Monterrey Convention Center, Cintermex:

- Best Industrial Exposition
- Best in Visitor/Exhibitor Satisfaction

B. 2018 AHR Expo Mexico – Centro Citibanamex, Mexico City, October 2-4
- 68,000 sq. ft. of exhibitor space sold
- 77,000 available sq. ft. available

Bill Harrison

June 12, 2017

Date

Chair

To: ASHRAE President, Tim Wentz; ASHRAE Excom; Mary Townsend

From: Dan Pettway, ASHRAE NATE Liaison

Subject: Report from NATE Fall Board Meeting

NATE (North American Technician Excellence) held its Spring Board Meeting on March 28th, 2017 at the AHRI Headquarters in Arlington, Virginia.

Meeting Highlights

Audit Report

The Audit Report confirmed that NATE's financial situation continues to improve. Their receivables continue to be reduced. Reported receivables were $621,000 three years ago, to $150,000 the following year, and now down to $115,000 last year. Their revenues currently are exceeding plan. The amount of financial information shared with the board in the report has increased over the fall meeting.

Chief Staff Officer Report

Chief Staff Officer, John Lanier, had much good news to share. He has completed a renovation of the NATE Staff giving it a much more stable operational footing. They have adopted a new system for both their online exams and to now record reported continuing education hours necessary for recertification. Recertification has increased because of the two-way communications now between certification holders and staff. Certification holders now report their continuing education as completed and staff communicates with holders reminding them of continuing education requirements required as their recertification approaches. NATE has cooperated with other organizations now recognizing their continuing education offerings for NATE recertification, making it easier for NATE certification holders to earn necessary continuing education hours. This has increased NATE's recertification percentage to 41%. NATE exam sales are 12% over plan year to date. NATE exams are moving to a majority of electronic testing in comparison to paper. The ratio was 55% paper to 45% electronic in 2014. The ratio for 2016 was 36% to 64%. NATE has added a new Ready to Work Exam covering Tools and Safety, an HVAC Support Technician Exam, and now offers EPA Part 608 Exams. Their initiatives for 2017 include updating several of their existing exams.

Marketing

It is most obvious that the hiring of a new marketing manager, Valerie Briggs, has been a driving force in NATE's performance improvements. She travels extensively, representing NATE at many manufacturer held distributor and dealer meetings promoting NATE education and certification. A number of their marketing efforts are now through social media and they are currently planning promotions celebrating the organization's 20th Anniversary.

Future of Refrigerants

As liaison from ASHRAE, I volunteered to give a short presentation on the research work ASHRAE is doing. My presentation was based on a presentation Jim Wolfe gave to TC 8.7. I asked Jim's permission to distribute his PowerPoint to the NATE Board. I also was able to get an additional PowerPoint for distribution from Julian De Bullet on the evolutions of refrigerants leading to where we are now. The discussion after my comments led into discussions concerning recent decisions at EPA where they will not consider recertification for current Part 608 certificate holders concerning the new refrigerants and are leaving refrigerant safety issues to OSHA. Mention was made that AHRI in conjunction with NATE and UNEP are considering a certification for refrigerant handling. Paul Stalknecht of ACCA mentioned they were also working on a training program for the 2L refrigerants. A comment was made that cooperation between groups working on new refrigerants issues, would be better than competition.

Strategic Board Discussions

The board discussed a number of subjects concerning the future direction of the organization. They included: establishment of a steering committee for new training and credential opportunities; how to accelerate the growth of NATE Certifications; development of a technician maturity path of credentials leading from Ready to Work, to Support Tech, to NATE Pro, and finishing with NATE Master; targeting specific customers with a Marketing Playbook, and developing their first Strategic Plan. There were also discussions on future Board nominating process and a needed bylaws review, which I volunteered to participate in.

Personal Observations and Discussions

I thought that the additional financial information provided to the Board demonstrated continuing maturity of the organization. At the Fall Meeting, only total expenses and revenues were reported. Detailed financial info was only shared with the executive committee during their meeting the day before.

As I am just beginning to know some of the members of the Board, I thought it quite unusual that the gent listed as NATE Parliamentarian was most knowledgeable and contributed to the refrigerant discussion. During the discussion, I wondered why he was so knowledgeable on 2L refrigerants so I Googled him only to discover that he is the Chief Staff Officer of AHRI, Steve Yureck. I was under the mistaken impression that NATE's Staff Officer also held that position with AHRI. During a subsequent break, I approached Steve and had a most pleasant conversation. He is a most impressive gent.

I also approached ACCA's Paul Stalknecht and asked how things were between ACCA and ASHRAE. He is still very sensitive to discussions that go back to Bill Bahnfleth's year as President. He still very sensitive that after 50 years of ASHRAE's absence in the residential market, they now want to compete with ACCA. I told him that I could not speak for ASHRAE, but the impression I had while on the Executive Committee was that we wanted to cooperate providing technology and expertise where it did not exist. That cooperation was ASHRAE's goal. I suggested that closer communication between

the leadership of the organizations would prevent unhealthy competition and costly duplication of efforts.

I engaged in a great conversation on variable speed compressors with Emerson / Copeland's Group President of Heating and Air Conditioning, Brent Schroeder. I told him of a failed attempt to get a number of the leading US AC Manufactures to participate in a proposed Residential Building Committee Seminar on the subject of variable speed compressors in future residential equipment. I was able to get Brent to commit to headline such a seminar in the future. As I was not reappointed to continue on RBC, I have passed this offer to Max Sherman and Chris Mathis of RBC.

In closing I would like to again thank you Tim, for the opportunity to serve as ASHRAE's Liaison to NATE. This opportunity allows me to provide some service to ASHRAE, while helping to improve the industry through contributions in another industry organization. Please direct any questions to my email.

Respectfully Submitted

Report of President Timothy Wentz
ASHRAE Travel for July 1, 2016
Through June 28, 2017

Date	Meeting	Location	Comments
July 5-7	White House meeting	Washington, DC	Met with senior White House advisors regarding A2L research
July 9 - 12	Purdue Compressor Conference	West Lafayette, IN	An excellent conference coordinated by long-time ASHRAE volunteer Eckhard Groll
July 13 -16	APPA Convention	Nashville, TN	Signed new MOU with APPA
July 21 - 24	Senior Officers Retreat	Omaha, NE	107° weather in Omaha for the retreat. It was a very productive meeting in spite of the heat
July 28 - 21	Region V CRC	Dayton, OH	Wonderful CRC. Great job by the Dayton Chapter.
Aug 4 - 7	Region IX CRC	Omaha, NE	My home chapter, the Nebraska Chapter, hosted the Region IX CRC. It was awesome, as always.
Aug 10 - 14	Region IV CRC	Atlanta, GA	Another great CRC. The venue at Lanier Island was top notch, as was the CRC.
Aug 17 - 21	Region I CRC	Rochester, NY	I really enjoyed this CRC and thought it was particularly well organized.
Sept. 7 - 8	Arkansas Chapter visit	Little Rock, AR	Excellent chapter meeting. I enjoyed meeting the members and reconnecting with Presidential Member Bill Harrison
Sept 9 - 12	CIBSE/ASHRAE staff exchange	Atlanta, GA	We restarted this excellent tradition and had a great meeting in Atlanta. This set the stage for our new Strategic Partnership Agreement.
Sept 12 - 13	NSF meeting	Ann Arbor, MI	Discussed NSF's proposed NSF-453 "Standard"
Sept 14 - 17	Visited the Lacrosse Chapter and also included a visit to Trane Inc.	Lacrosse, WI	Toured Trane's research facility and also met with local employers in Lacrosse
Sept 19 - 21	AHR Mexico Exposition	Monterrey, Mexico	Our co-sponsored Exposition set a new record for ASHRAE

Sept 24 - 28	Hong Kong and Macao Chapter visits	Hong Kong and Macao	Chartered the new Macao Chapter
Sept 29 – Oct 2	Region XIII and Region at Large CRC	Bangkok, Thailand	An amazing CRC with 35 chapters in attendance and over 540 people.
Oct 3 - 5	Board and ExCom meeting	Bangkok, Thailand	First Board meeting outside of North America
Oct 6 - 10	Ireland and Midlands UK section visits	Dublin, Ireland and Loughborough, UK	Excellent section meetings with a lot of energy from the members. Also met with local universities
Oct 11 – 15	ASHRAE/CIBSE 40th anniversary	London, England	Great celebration at a historic location. Discussed the new Strategic Partnership Agreement and possible endeavors to move that forward.
Oct 16 - 20	ICC Conference	Kansas City, MO	Huge conference that spans the entire week.
Oct. 26 - 28	New York City Chapter visit	New York, NY	A really fun visit with a YEA event following
Oct 29 – Nov 1	ASPE convention	Phoenix, AZ	A very interesting conference. Met with the ASPE Board of Directors for over an hour regarding future
Nov 6 to Nov 20	Colombia, Brazil, Chile and Argentina Chapter visits	Bogota, Colombia Rio de Janeiro and Belo Horizonte, Brazil Santiago, Chile Buenos Aires, Argentina	An amazing amount of energy in our South American Chapters. Much thanks to DRC Dan Rogers and Ross Montgomery for making the trip so successful. The chartering documents for the Paraguay Chapter were presented during this trip.
Nov 28 - Dec. 2	Danube Chapter visit, attend the 47th International Congress and Exhibition	Belgrade, Serbia	A wonderful conference organized by long-time ASHRAE volunteers Branco and Maria Todorovic
Dec 3 – Dec 6	60th Anniversary of the Quebec City Chapter	Quebec City, Quebec, Canada	A very memorable event in a spectacular venue at the Hotel Frontenac
Dec 11 – Dec 18	Visited chapters Sacramento Valley, Southern California, Orange Empire, Tri-County, Golden Gate, San Jose and San Diego chapter visits	Sacramento, Los Angeles, San Francisco and San Diego, California	Great job by DRC Karine Leblanc on organizing this trip through Region X. Visited seven chapter in six days, plus attended a RP fundraiser in San Diego.

Jan 8 – 12, 2017	Visited chapters in Charleston, Myrtle Beach Section, Savannah Section and New Jersey	Charleston and Myrtle Beach, South Carolina Savannah, Georgia Newark, New Jersey	This was a great visit to chapters and sections in both Region IV and Region I. The New Jersey Chapter visit was a joint meeting with the New Jersey Chapter of MCAA.
Jan 16 - 20	Space Coast, Sarasota Section, Florida West Coast, Southwest Florida, Central Florida chapter visits	Tampa, Fort Meyers and Orlando, Florida	Great job by DRC Dan Rogers in navigating me through a rigorous schedule that included five chapters in four days.
Jan 25-Feb 2	ASHRAE Winter Conference & AHR Exhibition	Las Vegas, Nevada	The winter meeting set numerous records for ASHRAE. Largest Expo and highest registration amongst them.
Feb 6 – Feb 8	Chapter visits to Southern Piedmont, North Piedmont and Triangle Chapters	Raleigh, Greensboro and Charlotte, North Carolina	Much thanks to Presidential Member Tom Phoenix for the great hospitality and setting up this memorable meeting.
Feb 12 – Feb 18	A swing through Region XI and chapter visits at Saskatoon, Regina, British Columbia and Oregon	Saskatoon and Regina, Saskatchewan Vancouver, British Columbia Portland, Oregon	Great job done by Keith Yelkin in setting up this great visit to Region XI.
Feb 21 – Feb 28	Attended the ACREX conference and exposition in Delhi, India. Also met with Hydromax, a local manufacturer.	Met with the officers from the chapters in India, including India, Western India, Chennai, and Pune Chapter	Much thanks to Ashish Rakheja in setting up the meeting with the ASHRAE chapters from India
Mar 3 – Mar 9	Attended the Mechanical Contractors Association of America's annual conference	San Diego, California	A great conference, as always. Their welcome party was on the USS Midway.
Mar 13 – Mar 18	Attended meetings in Japan with the ASHRAE Japan Chapter, SHASE, JSRAE, Nikken Sekkei and Daikin	Tokyo and Osaka, Japan	A very productive and busy schedule. The new Daikin research center is impressive. Met with our Japan Chapter, as well as two local employers.
Mar 22 – Mar 26	Spring ExCom Retreat	Santa Barbara, California	A great retreat and very productive.

Mar 28 – Apr 1	A swing through Region V, including visits at the Detroit, Western Michigan, Fort Wayne, Northern Indian, Central Indiana, Columbus and Cleveland chapters	Detroit and Grand Rapids, Michigan Fort Wayne, Indianapolis and South Bend, Indiana Cleveland and Columbus, Ohio	Great job done by Doug Fick, DRC of Region V, and Jim Arnold, CTTC RVC, setting up an amazing schedule. I made 11 presentations and visited 7 chapters in four days, including student branches and local employers
Apr 2 – Apr 4	General Assembly meeting of REHVA	London, England	An excellent meeting that highlighted the diverse nature of REHVA. We also took the opportunity to continue our negotiations on a new MOU at this meeting.
Apr 5 – Apr 6	ASHRAE/CIBSE Technical Symposium	Loughborough, England	The symposium was very well done and was coordinated by long-time ASHRAE volunteer Tim Dwyer. We signed a new MOU with the International Organization of Refrigeration at the symposium.
Apr 7 – Apr 8	Charted new Scotland Section	Glasgow, Scotland	A great honor to charter our new section in Scotland!
Apr 9 – Apr 15	Attended the Chinese Association of Refrigeration (CAR) annual meeting and Exposition	Shanghai, China	CAR is an important partner in China. Visited with their leadership and also attended their exposition, which was impressive.
Apr 19 – Apr 22	A series of meeting with the United Nations Environmental Program (UNEP)	Paris, France	A great meeting with the UNEP team. We spent two days working on the specifics of our new work plan, approved in Las Vegas. We also worked on a joint proposal for the K-CEP grants.
Apr 23 – Apr 25	Leadership meetings with stakeholders in Washington DC	Washington DC	Met with a wide variety of stakeholders, including the Alliance to Save Energy (ASE), the National Institute of Building Sciences (NIBS), the Mechanical Contractors Association of America (MCAA) and, of course, the Department of Energy (DOE) and the Environmental Protection Agency (EPA)

Apr 29 – May 2	Visited our three chapters in Pakistan; Pakistan, Northern Pakistan and Central Pakistan	Karachi, Islamabad and Lahore, Pakistan	Kudos to DRC Farooq Mehboob who set up an outstanding tour of our three chapters in Pakistan.
May 3 – May 5	Chartered our newest chapter in Cyprus	Limmosol, Cyprus	Chartered the new Cyprus Chapter and attended the first international 'Energy in Buildings – Cyprus' conference. Great job done by Dimitris Charalambopoulos.
May 5 – May 9	Visited the Hellenic Chapter	Athens, Greece	Met with the Hellenic Chapter and attended the first international 'Energy in Buildings – Northern Hellas' conference. Great job done by Ioanna Deligkiozi, president of the Hellenic Chapter
May 9 – May 13	Visited the Turkey Chapter	Istanbul, Turkey	Meeting with the Board of ISIB and the BOG for the Turkish Chapter of ASHRAE in Istanbul. Much thanks to Bahadirhan Tari, president of the Turkish Chapter, Zeki Poyraz and Farooq Mehboob for putting together a superb program.
May 18 – May 21	Attended Region XI CRC	Bellevue, Washington	Attended an excellent Region XI CRC. Kudos to Keith Yelkin, DRC of Region XI and Tamas Benscik, CRC General Chair
May 22 – May 25	Signing of new trilateral agreement with CIBSE and REHVA	Brussels, Belgium	Met with John Field, President of CIBSE, and Stefano Corgnati, President of REHVA to sign a trilateral agreement between the three organizations, pledging to work on harmonization of Standards, amongst other initiatives
June 9 – June 12	Annual meeting of senior officers with CIBSE	Boston, Massachusetts	Second annual senior officer meeting with CIBSE
June 21 – June 28	ASHRAE annual meeting	Long Beach, California	The finish line!