INVITATION TO SUBMIT A RESEARCH PROPOSAL ON AN ASHRAE RESEARCH PROJECT

1848-TRP, Assessing the Impacts and Value of ASHRAE's Standards and Technology

Attached is a Request-for-Proposal (RFP) for a project dealing with a subject in which you, or your institution have expressed interest. Should you decide not to submit a proposal, please circulate it to any colleague who might have interest in this subject.

Sponsoring Committee: MTG/IAST

Budget Range: $100,000 may be more or less as determined by value of proposal and competing proposals.

Scheduled Project Start Date: November 1, 2018 or later.

All proposals must be received at ASHRAE Headquarters by 8:00 AM, EDT, September 28, 2018. NO EXCEPTIONS, NO EXTENSIONS. Electronic copies must be sent to rpbids@ashrae.org. Electronic signatures must be scanned and added to the file before submitting. The submission title line should read: 1848-TRP, Assessing the Impacts and Value of ASHRAE's Standards and Technology", *and "Bidding Institutions Name"* (electronic pdf format, ASHRAE's server will accept up to 10MB)

If you have questions concerning the Project, we suggest you contact one of the individuals listed below:

For Technical Matters:
Lawrence Markel
CSRA/GDIT
835 Innovation Drive, Suite 100
Knoxville, TN 37932
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E-Mail: Lawrence.Markel@gdit.com

For Administrative or Procedural Matters:
Manager of Research & Technical Services (MORTS)
Michael R. Vaughn
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Contractors intending to submit a proposal should so notify, by mail or e-mail, the Manager of Research and Technical Services, (MORTS) by September 14, 2018 in order that any late or additional information on the RFP may be furnished to them prior to the bid due date.

All proposals must be submitted electronically. Electronic submissions require a PDF file containing the complete proposal preceded by signed copies of the two forms listed below in the order listed below. **ALL electronic proposals are to be sent to rpbids@ashrae.org.**

All other correspondence must be sent to ddaniel@ashrae.org and mvaughn@ashrae.org. Hardcopy submissions are not permitted. **In all cases, the proposal must be submitted to ASHRAE by 8:00 AM, EDT, September 28, 2018. NO EXCEPTIONS, NO EXTENSIONS.**

The following forms (Application for Grant of Funds and the Additional Information form have been combined) must accompany the proposal:

(1) ASHRAE Application for Grant of Funds (electronic signature required) and
(2) Additional Information for Contractors (electronic signature required) ASHRAE Application for Grant of Funds (signed) and

ASHRAE reserves the right to reject any or all bids.

State of the Art (Background)

While ASHRAE has made numerous contributions to HVAC&R, there is no accessible documentation enabling the Society and its volunteer members to describe the magnitude, breadth and importance of those contributions. Existing descriptions of the results of ASHRAE's standards and technology developments tend to be limited to a few specific application areas. This project will enable ASHRAE to go beyond anecdotal citations of its contributions and recognize the full breadth of its influence and scope of its volunteer members' activities.

Advancement to the State-of-the-Art

This project will develop as comprehensive a list as possible of the impacts of ASHRAE standards and technology; develop objective, verifiable, fact-based methods to estimate the magnitude of those impacts (quantitative) and/or describe the significance of those impacts (qualitative); obtain data and identify data sources to exercise the developed methods; and document the procedures, reasoning, assumptions, equations, and data sources used in sufficient detail for ASHRAE staff and volunteers to update such impacts assessments in the future. This will provide specific and verifiable metrics describing ASHRAE's influence and the value of its activities.

Justification and Value to ASHRAE

Having a clear, concise, and defensible description of ASHRAE's contributions will:

- Encourage more people to become members and/or get involved in contributing to ASHRAE activities. This could influence members, potential members, and employers.
- Identify ASHRAE's significance to government/regulatory policy makers, other professional organizations, and standards bodies, thus increasing ASHRAE's influence and respect for its policies and products. This could be particularly important for supporting Government Affairs Committee initiatives, ASHRAE Washington office initiatives, and international activities (including UN, IEA, and non-US governments).

Objectives

ASHRAE wants to obtain specific – quantitative (preferred) and qualitative – instances of the impacts its "standards and technology" have had. "Standards and technology" includes standards, guidelines, design guides, other publications, research, and certification and training activities.

The desired outputs of this project are:

- A comprehensive list of the contributions ASHRAE and its members have made.
  - Those contributions shall be stated in terms of metrics that are quantified to the extent possible.
  - The benefits/impacts shall be stated in terms that can be recognized and accepted by the general public as making the built environment better, safer, healthier, environmentally friendly, more affordable, energy efficient, etc.
  - The impacts of ASHRAE S&T shall be presented in very readable (for the lay public) reports, briefs or press releases, presentations, articles, or other documents useful for ASHRAE chapters and for ASHRAE marketing and advocacy efforts.
- A documented methodology for identifying and quantifying impacts and benefits that enables ASHRAE's claimed benefits/impacts to be verified.
- Identified data sources to enable ASHRAE staff or members to update the magnitude of ASHRAE technology impacts in the future.

Scope:

This project will be very collaborative, with significant and frequent interaction between the selected contractor and the Project Monitoring Subcommittee (PMS) representing the MTG. The MTG has developed a suggested list of impacts of ASHRAE technology, metrics that could be used to characterize those impacts, and methods and data that could be used to quantify and evaluate those impacts (See the Appendix, "Other Information for Bidders"). This section presents the requirements for contractors' proposals to address the statement of work, and a technical approach consisting of 3 tasks.

Proposal Requirements:

The ASHRAE Multidisciplinary Task Group (MTG) IAST has suggested a categorization of impacts of ASHRAE's standards and technology, described possible methods to quantify those impacts, and identified some data that could support those assessment methods. In their proposals, the bidders shall discuss those suggestions:

- Offering any changes (additions, deletions, enhancements, redefinitions) of the impact metrics and their reasons for making those changes.
- Provide their proposed methodologies to identify and quantify impact metrics.
- Identify what data or other resources (including information to be requested from ASHRAE committees or staff) they will use to implement the methodologies.
- Describe any risks or challenges to successfully completing the proposed metrics assessments, and possible risk mitigation or alternative means to estimate impacts.

Proposals shall also describe the technical approach, personnel and other resources, schedule, and costs to accomplish the following three tasks:

Task 1: Develop List of Impacts, Metrics, and Assessment Procedures

Objective: To develop an agreed-upon list of impacts and the manner in which they will be assessed, through a collaborative process of the contractor and the MTG.

Approach

Within 60 days after work authorization, the contractor will send the PMS a *Draft Methodology Report*, consisting of a detailed list of proposed impacts, the metrics or descriptors by which they will be characterized, data or other information sources that will be accessed, and procedures to quantify the impact metrics.

The report will include the quantitative metrics proposed in the contractor's proposal, incorporate comments or suggestions received by the PMS as a result of the proposal's evaluation, and add additional impacts and evaluation /assessment methods developed after further research into published reports and available information sources.

The report will also identify major technical accomplishments or important milestones in which ASHRAE played a significant role, whose impacts are very significant but not easily quantified. (E.g., development of new safety-oriented standards/guidelines for tall buildings after disastrous/extraordinary events; or references to ASHRAE products by federal, state and local executive, policy and legislative bodies.) These milestones will be described qualitatively in the final report. The contractor will identify proposed milestones based on knowledge of the HVAC&R field; review of ASHRAE literature, research projects, standards and guidelines, testing labs (e.g., Kansas State University's manikin-based comfort research), etc.; interviews with ASHRAE staff, committees, Life Members, etc.; review of published histories (such as *Proclaiming the Truth* or *Heat and Cold*, published by ASHRAE); biographies of ASHRAE Hall of Fame Members, and other sources.

The PMS shall provide written comments within 15 days, and the contractor shall schedule a conference call with the PMS members to discuss the PMS input. Contractor shall submit a *Revised Methodology Report* to the PMS within 30 days of the conference call.

As work proceeds in the contract, the *Methodology Report* shall be updated to reflect results of ongoing analysis and research and to incorporate suggestions from the PMS, contractor, or ASHRAE staff. It is intended that the *Methodology Report* be written in a format suitable for it to be incorporated in the project's final report, and that the *Final Methodology Report* will in fact become one or more chapters or appendices of the final report.

Deliverables and Schedule

1. *Draft Methodology Report* – within 60 days after work authorization
2. PMS provides comments within 15 days after #1.
3. Conference call with PMS – within 15 days after #2
4. *Revised Methodology Report* – within 30 days after #3
5. *Updated Methodology Report* – as necessary, to incorporate major changes in methodology, as agreed to with the PMS

6. *Final Methodology Report* – 8 months after work authorization

Task 2: Calculate Impacts

Objective: To calculate the quantitative metrics and document the milestones/accomplishments of ASHRAE Standards and Technology.

Approach

Using the impacts identified and methods defined in Task 1, the contractor will obtain necessary data to 1) calculate the quantitative impacts of ASHRAE standards and technology, and 2) provide descriptions of the major technical accomplishments in which ASHRAE played a significant role.

The contractor will document each quantitative impact/metric or group of related impacts/metrics in a concise, self-contained report or memo. These short individual impact assessments will be formatted so they can be reviewed individually by the PMS and then incorporated directly as sections or subsections into the final report (see Task 3). Qualitative milestone impact descriptions will also be prepared as short narratives capable of being read and reviewed as stand-alone essays. All data sources (including publications and interviews) shall be fully referenced.

On a monthly basis, as individual metric calculations or milestone descriptions have been completed, they shall be submitted to the PMS for review by the MTG. The contractor is also encouraged to submit in-process or draft assessments to the PMS if feedback or guidance from the MTG is needed. For example, the contractor could describe alternate ways to calculate a metric or present an impact, or describe a problem they are having with obtaining specific information needed to quantify an impact, and ask for comments or suggestions from the PMS.

Deliverables and Schedule

- *Drafts of individual impact assessments and milestone descriptions* shall be submitted to the PMS for review on a monthly basis. (At the end of months 3, 4, 5, 6, and 7).
- The PMS shall provide comments to *draft impact assessments within 30 days*. *Final individual impact assessments and milestone descriptions*, incorporating PMS feedback, shall be submitted to the PMS as part of the next monthly progress report (see Task 3) occurring 30 days after the contractor has received the PMS's review comments.

Task 3: Reporting and Final Report

Objectives: To keep the PMS informed of project progress on a timely basis, facilitate collaboration between the contractor and the PMS, and incorporate the research results into the final report.

Approach

Sixty days after contract authorization, the contractor shall submit a *draft annotated outline of the final report* to the PMS for review. The final report outline shall be updated and populated during the course of the project, as impact assessments are completed and/or as alternate impact metrics or evaluation methods are adopted based on research results (including identification of new sources of information) and in consultation with the PMS.

Contractor shall submit a *Monthly Progress Report* to ASHRAE Manager of Research and Technical Services (MORTS) and the PMS. The monthly Report will consist of:

- Brief description of progress, noting any problems, issues, significant accomplishments, or changes to schedule.
- Drafts of individual impact assessments and milestone descriptions to be reviewed by the PMS.
- Final individual impact assessments and milestone descriptions responding to PMS review comments.
- Updated *Final Report Outline*.

Contractor shall prepare a *Draft Final Report* and submit it to the PMS at the end of month 9.

Within 30 days after receiving PMS comments, the contractor shall incorporate the PMS's review comments and submit the *Final Report* and a *Technical Paper* summarizing the results of the project.

Deliverables and Schedule

1. *Monthly Reports*, at the end of months 2, 3, 4, 5, 6, 7, 8, 9 after contract start.
2. *Annotated Outline of the Final Report*, 60 days after contract authorization, updated if appropriate every month.
3. *Draft and Final Individual Impact Assessments,* submitted on a monthly basis.
4. *Draft Final Report*. At the end of month 9 after contract start.
5. *Final Report* 30 days after receiving PMS comments on the draft final report.
6. *Science and Technology for the Built Environment* or ASHRAE *Transactions Technical Paper summarizing project results,* submitted after the MTG has approved the final report.

Deliverables:

Deliverables, Progress, Financial and Final Reports, Research or Technical Paper(s), and Data shall constitute required deliverables ("Deliverables") under this Agreement and shall be provided as follows:

a. Progress and Financial Reports

Progress and Financial Reports, in a form approved by the Society, shall be made to the Society through its Manager of Research and Technical Services at quarterly intervals; specifically on or before each January 1, April 1, June 10, and October 1 of the contract period.

Furthermore, the Institution's Principal Investigator, subject to the Society's approval, shall, during the period of performance and after the Final Report has been submitted, report in person or by webinar/conference call to the sponsoring Multidisciplinary Task Group (MTG) in conjunction with the annual and winter meetings, and be available to answer such questions regarding the research as may arise.

Monthly Reports, containing information as described in Task 3 of the Scope/Technical Approach shall be submitted to MORTS for review by the PMS. These reports shall be submitted commencing at the end of Month 2 and continuing through the end of the contract.

b. Methodology Report

Draft and Final report of the impact assessment methodology (as Described in Task 1 of the Scope/Technical Approach) The Methodology Report will consist of a detailed list of impacts, the metrics or descriptors by which they will be characterized, data or other information sources that will be accessed, and procedures to quantify the impact metrics. The Methodology Report will identify major technical accomplishments or important milestones in which ASHRAE played a significant role, whose impacts are very significant but not easily quantified.

c. Individual impact assessments and milestone descriptions

Draft and final impact assessments and descriptions of milestones, in a format suitable for direct inclusion into the final report. (See description in Task 2 of the Scope/Technical Approach)

d. Final Report

A written Final Report, in a form approved by the Society, shall be prepared by the Institution in both draft and final form, as described in Task 3 of the Scope/Technical Approach. The final Reports shall be submitted to the Society's Manager of Research and Technical Services by the end of the Agreement term, containing complete details of all research carried out under this Agreement. Unless otherwise specified, six copies of the final report shall be furnished for review by the Society's Project Monitoring Subcommittee (PMS).

Following approval by the PMS and the MTG, in their sole discretion, final copies of the Final Report will be furnished by the Institution as follows:

- An executive summary in a form suitable for wide distribution to the industry and to the public.
- Two copies on CD-ROM; one in PDF format and one in Microsoft Word.

e. Science and Technology for the Built Environment or ASHRAE Transactions Technical Paper

One or more papers shall be submitted first to the ASHRAE Manager of Research and Technical Services and then to the "ASHRAE Manuscript Central" website-based manuscript review system in a form and containing such information as designated by the Society suitable for publication. Papers specified as deliverables should be submitted as either Research Papers for Science and Technology for the Built Environment or Technical Paper(s) for ASHRAE Transactions. Research papers contain generalized results of long-term archival value, whereas technical papers are appropriate for applied research of shorter-term value, ASHRAE Conference papers are not acceptable as deliverables from ASHRAE research projects. The paper(s) shall conform to the instructions posted in "Manuscript Central" for an ASHRAE Transactions Technical or Science and Technology for the Built Environment paper. The paper title shall contain the research project number (1848-RP) at the end of the title in parentheses, e.g., (1848-RP).

Note: A research or technical paper describing the research project must be submitted after the TC has approved the Final Report. Research or technical papers may also be prepared before the project's completion, if it is desired to disseminate interim results of the project. Contractor shall submit any interim papers to MORTS and the PMS for review and approval before the papers are submitted to ASHRAE Manuscript Central for review.

f. Data

The Institution agrees to maintain true and complete books and records, including but not limited to notebooks, reports, charts, graphs, analyses, computer programs, visual representations etc., (collectively, the "Data"), generated in connection with the Services. Society representatives shall have access to all such Data for examination and review at reasonable times. The Data shall be held in strict confidence by the Institution and shall not be released to third parties without prior authorization from the Society, except as provided by GENERAL CONDITION VII, PUBLICATION. The original Data shall be kept on file by the Institution for a period of two years after receipt of the final payment and upon request the Institution will make a copy available to the Society upon the Society's request.

g. Project Synopsis

A written synopsis totaling approximately 100 words in length and written for a broad technical audience, which documents 1. Main findings of research project, 2. Why findings are significant, and 3. How the findings benefit ASHRAE membership and/or society in general shall be submitted to the Manager of Research and Technical Services by the end of the Agreement term for publication in ASHRAE *Insights*

The Society may request the Institution submit a technical article suitable for publication in the Society's *ASHRAE JOURNAL*. This is considered a voluntary submission and not a Deliverable.

All Deliverables under this Agreement and voluntary technical articles shall be prepared using dual units; e.g., rational inch-pound with equivalent SI units shown parenthetically. SI usage shall be in accordance with IEEE/ASTM Standard SI-10.

Level of Effort

The project anticipates 4 to 5 professional-months for the principal investigator and/or senior researchers and 8 professional-months for research technicians on the level of undergraduate or graduate students The estimated cost is $100,000 and the project is expected to take 12 months

Other Information to Bidders (Optional):

This section contains some preliminary thoughts on categorizing impacts of ASHRAE standards and technology and methods to value those impacts. It is meant to offer suggestions to bidders, not to constrain their proposed methodology. Note also that in identifying ASHRAE's contributions, since ASHRAE collaborates with other organizations and stakeholders, impacts are those for which ASHRAE's contribution is significant. It is not necessary to limit impacts to those for which ASHRAE is solely responsible or to estimate the magnitude of ASHRAE's "share."

As an example, for reduced building energy utilization Intensity (EUI), ASHRAE (e.g., 90.1) isn't solely responsible, but pre-90.1 EUIs could be compared with present (post-90.1) EUIs using CBECS or other data sources. Similarly, reduced instances of sick building syndrome (SBS) aren't just due to Standard 62, but one could look at declines in incidence of SBS after 62 was developed.

Impacts can be classified according to:

- Energy efficiency (e.g., Standards 90.1, 100; TC 10.7; TC 7.6, Guideline 14; AEDGs)
- Health, safety and comfort (e.g., Standards 62.1, 188, 55, 170; Guideline 12)
- Environmental aspects (e.g., Standards 189.1, 34, 15)

Metrics could include energy use, improved equipment reliability, pollutant emissions, number of buildings (or area of conditioned space in buildings) influenced, number of reported cases of disease or change in trends of reported cases (e.g., how did the rate of increase of reported Legionella cases change after ASHRAE involvement), number of downloads of AEDGs (i.e., number of people increase in accessing ASHRAE technology), number of appliances complying with ASHRAE standards, instances of ASHRAE Standards / certifications referenced in local codes and ordinances.

Qualitative influences could include the development of a basis for measuring clothing (CLO) and activity (MET) that enabled comfort-based design requirements (Standard 55), the influence of ASHRAE-sponsored environmental laboratory at Kansas State University, adoption of filtration requirements, magnitude of adoption and application of ASHRAE standards specifying a method of test, increase in low GWP refrigerants after ASHRAE research or development of refrigerant management plans, municipalities (or agencies) adopting ASHRAE technology (e.g., US's incorporating Standard 90.1 into legislation, CDC utilizing Standard 188 and Guideline 12).

Data sources could include published data bases (CBECS); commercial, government (DOE, CDC) or agency (IEA) reports, legislative analyses, etc., surveys ASHRAE has done of members or document purchasers and AEDG downloaders, etc.

Another possible source of information is evaluating the energy savings (from DoE energy standards) by reviewing 10CFR430 and 431, noting the references to ASHRAE test standards and also noting AHRI standards. (Most AHRI standards reference ASHRAE standards for method of test, with AHRI spelling out the conditions of test.)

Two examples follow of estimating impacts on metrics where ASHRAE has had a significant effect, using other agencies' analyses and/or readily available data bases.

Example 1:
DOE-calculated Impacts of DOE Energy Efficiency Standards[1]

Energy Savings (quads), cumulative through:

	2005	2015	2030
Refrigerators	3.2	9.1	19.5
Freezers	0.5	1.3	2.5
Central Air Conditioners	1.1	3.6	8.5
Room Air Conditioners	0.4	1.1	2.0
Gas Furnaces	1.2	2.9	4.8
Water Heaters	1.4	3.3	7.2
Clothes Washers	0.6	3.6	12.3
Clothes Dryers	0.5	1.5	3.1
Dishwashers	0.3	0.7	1.5
Fluorescent Lamp Ballasts*	n.a.	0.7	2.3
TOTAL	9.2	27.8	63.7

Note: A savings of 1 quad is equal to the annual primary energy consumption of 5.5 million average U.S. households (5% of the total).

Consumer Benefit (NPV in billion 2001 $), cumulative through:

	2005	2015	2030
Refrigerators	10.5	26.1	40.9
Freezers	2.5	5.1	7.2
Central Air Conditioners	1.5	5.3	11.7
Room Air Conditioners	0.5	4.7	6.3
Gas Furnaces	-0.2	2.5	4.2
Water Heaters	2.5	12.8	17.0
Clothes Washers	3.2	11.4	36.3
Clothes Dryers	2.4	5.7	8.5
Dishwashers	0.4	1.4	2.6
Fluorescent Lamp Ballasts*	n.a.	2.7	3.4
TOTAL	23.3	77.7	138

Calculated NPV using 7% discount rate, per OMB guidance.
* Fluorescent lamp ballasts standards take effect in 2005.

[1] Includes standards that will take effect in 2006 for central air conditioners and heat pumps and in 2007 for clothes washers.

Avoided Carbon Emissions (million tons C), cumulative through:

	2005	2015	2030
Refrigerators	50	147	318
Freezers	8	21	41
Central Air Conditioners	17	57	138
Room Air Conditioners	6	17	33
Gas Furnaces	19	46	77
Water Heaters	21	51	115
Clothes Washers	6	56	193
Clothes Dryers	8	23	50
Dishwashers	4	11	23
Fluorescent Lamp Ballasts*	n.a.	19**	n.a.
TOTAL	139	448	988

Note: tons of CO_2 = tons C x 3.67

Avoided NOx Emissions (thousand tons), cumulative through:

	2005	2015	2030
Refrigerators	437	1001	1914
Freezers	69	146	252
Central Air Conditioners	144	378	809
Room Air Conditioners	58	119	205
Gas Furnaces	158	321	486
Water Heaters	178	361	701
Clothes Washers	72	372	1196
Clothes Dryers	62	156	304
Dishwashers	32	75	145
Fluorescent Lamp Ballasts*	n.a.	60**	n.a.
TOTAL	1210	2989	6012

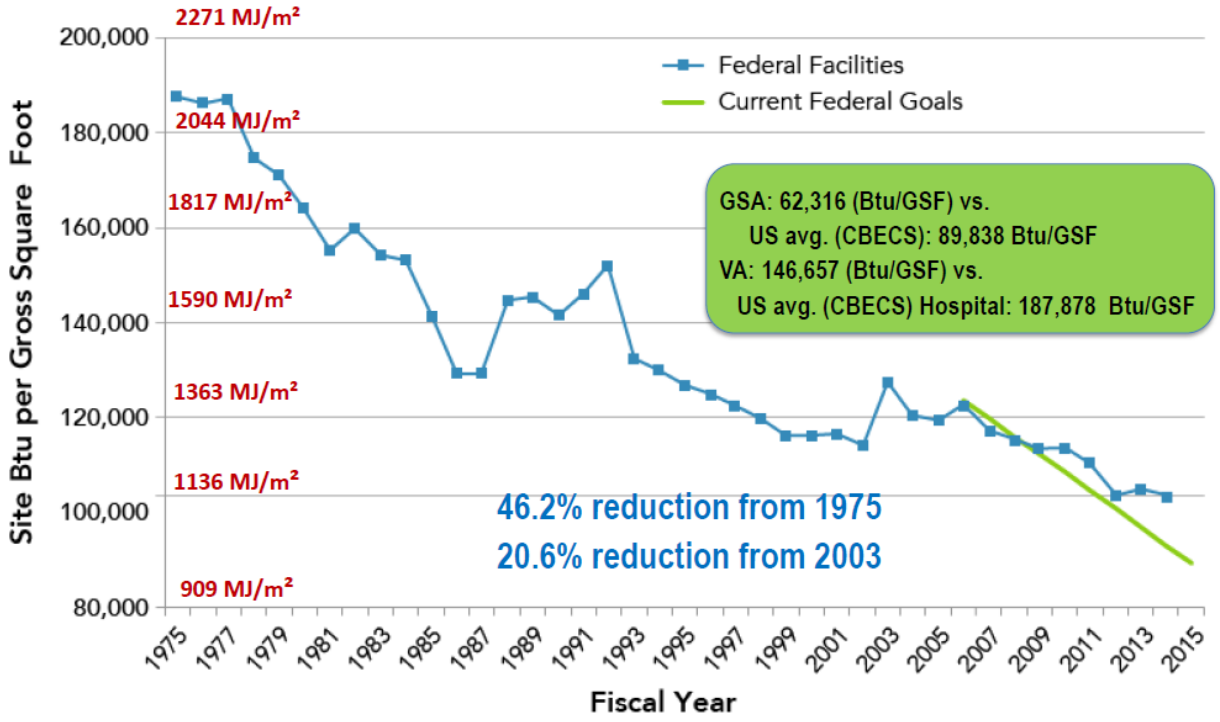
* Fluorescent lamp ballasts standards take effect in 2005.
** Through 2020

Example 2:
Estimating Reduced Building EUI Using CBECS and DOE Data

Here are the overall CBECS energy intensity numbers for available past years:

1989 91,600 Btu/GSF
1992 80,900 Btu/GSF
1995 90,500 Btu/GSF
2003 89,800 Btu/GSF

This slide is showing improved EUI of government buildings. But CBECS data could be used to look at the overall U.S. commercial building fleet



Project Milestones:

No.	Major Project Completion Milestone	Deadline Month
1	Draft Methodology Report	2
2	Revised Methodology Report (further updates as necessary)	4
3	Monthly Reports (includes individual impact assessments – Task 2)	2-9
4	Annotated Outline of the Final Report (updated monthly if appropriate)	2
5	Draft Final Report	9
6	Final Report	10
7	Technical Paper (submitted after approval of the final report0	12

Proposal Evaluation Criteria

The MTG does not anticipate that this research will require complex calculations or sophisticated modeling. Rather, the research emphasis will be to identify and classify impacts of ASHRAE S&T and to develop defensible means to describe and estimate (to the extent practical) those impacts. The contractor's PI and/or senior researchers should be familiar with the HVAC&R field, with ASHRAE's activities and structure, and with what data are available to support this project.

No.	Proposal Review Criterion	Weighting Factor
1	Contractor's understanding of Work Statement as revealed in proposal. ASHRAE is seeking to develop an objective, verifiable, fact-based value statement for ASHRAE standards and technology. Contractor should suggest how they intend to accomplish this, building on the approach and methodology suggested in the request for proposals. The contractor should discuss their approach to categorizing and quantifying impacts, including knowledge of what data are available, anticipated gaps in data, and how the contractor intends to overcome them. Simply repeating the Scope of Work from the RFP is not an indication of understanding of the Work Statement.	25%
2	Quality of methodology proposed for conducting research. Describe the contractor's senior researchers' familiarity with the HVAC&R, building and energy efficiency fields and capabilities to model impacts. How will more junior researchers' efforts be supervised and incorporated? (i.e., project management plan) How will the contractor address technical problems in evaluating impacts or overlapping impacts? Demonstrate the ability to model impacts and to prepare clearly-written technical reports. Does the contractor have access to data base, models and reports necessary to successfully complete this project?	25%
3	Qualifications of personnel, their ASHRAE involvement, and publications/research. How broad is the expertise of the project personnel across the HVAC&R, building and energy efficiency fields? Will the contractor be able to identify and assess impacts of all types (e.g., Energy Efficiency; Health, Safety and Comfort; and Environmental)? Both quantifiable (e.g., BTUs, emissions, sustainability, number of buildings or area of conditioned space affected, equipment service life or reliability, operating costs, number of persons certified or trained, number of persons accessing ASHRAE documents or guides) and qualitative (recognition of impact of milestones or technology advancements)?	30%

	Familiarity with and involvement in ASHRAE activities and products is very important, both to identify where ASHRAE has had a significant impact with its standards and technology, and to be able to reach out to appropriate ASHRAE committees and staff to obtain data and other information to document those impacts. Varied and broad involvement with ASHRAE TCs, SPCs, SSPCs, GPCs, Committees, publications, research projects, chapters, etc. will be valued. However, there will not be additional weight given, for example, to a Presidential Member compared to a member who is an active contributor to several TCs, publications, and chapter activities	
4	Student involvement This project is not expected to require a high level of complexity or sophistication for calculating impacts. It is anticipated that students – undergraduate or graduate – could successfully undertake the analytical activities if well-supported by senior staff knowledgeable in HVAC&R, the built environment, ASHRAE, and relevant data bases. Therefore, precedence will be given for significant student participation, as researching ASHRAE's positive impacts, (especially being paid to do so) may encourage the students' further involvement in the HVAC&R industry	20%

References

1. *Heat and Cold,* Donaldson, Nagengast, ASHRAE
2. *Proclaiming the Truth, an Illustrated History of ASHRAE*
3. Various ASHRAE Standards and Publications
4. CBECS