Opportunities to Advance the Building Energy Efficiency Market in the Health Care Sector

January 7, 2013

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1. Executive Summary

This report presents recommendations on potential high impact philanthropic investments to advance deep building energy efficiency improvements at scale within the healthcare sector. It is one of five reports being developed for a coalition of six philanthropies that are collaborating to see what they - and others - might do to rapidly increase and scale the energy efficiency retrofit market for buildings in the United States. These philanthropies are the Doris Duke Charitable Foundation, Energy Foundation, Kresge Foundation, Living Cities, MacArthur Foundation and Rockefeller Foundation. The other sectors for which market development strategies are being developed include: commercial office, commercial retail, single-family residential, and multifamily residential.

In the summer of 2012, expert panels of 10-12 individuals were convened for each of these sub-segments. These panels developed recommendations on priority approaches and research needs for each sector. The recommendations in this and the other segment reports build upon these initial ideas.

The process used to develop these recommendations included background research on energy efficiency strategies for the healthcare sector and interviews with 33 participants in the sector, representing healthcare systems, NGOs, trade associations, service providers and utilities.[1] The interviews solicited feedback on the recommendations from the expert panel as well as other ideas the interviewees had on how to advance this market.

The Healthcare Context

The healthcare sector is one of the largest segments of the U.S. economy (17% of U.S. GDP) and a major producer of greenhouse gas emissions (estimated to be responsible for 8% of total U.S. emissions). Healthcare facilities consume 4% of the total energy consumed in the U.S., and hospitals are 2.5 times more energy intensive than the average commercial building. Because of this level of energy intensity, it makes sense as a target for philanthropic investments to reduce energy consumption and GHG emissions. At the same time it is a sector characterized by:

- Enormous market change and demands for cost reductions to improve profitability
- Low cost of energy as a percent of total operating costs
- A conservative risk-averse management culture
- High levels of regulation
- Limited external incentives for energy efficient operations
- Many existing sustainability initiatives that are not well coordinated with each other

Interviewee Feedback on the Expert Panel Recommendations for Priority Approaches

The priority approaches and research projects recommended by the expert panel included:[2]

[1] Unless otherwise noted, all quotes are from project interviews. Quotes are provided without attribution to protect confidentiality.

[2] See **Attachment 3** for more detail on these recommendations.

Priority Approaches	Research Projects
1. Fund the Healthier Hospital Initiative of Practice Greenhealth, Health Care Without Harm, the Center for Health Design and 11 major hospital systems. 2. Form a new mission-driven ESCO focused on medical clinics. 3. Establish the total carbon footprint of the extended health care enterprise.	4. Prepare the business case for energy efficiency investments, including non-energy benefits such as impacts on health. 5. Explore and document financial and technical assistance options for clinics (as a predecessor to a business plan for a special purpose ESCO). 6. Develop the design for a baseline study of healthcare carbon emissions.

A summary of the interviewee feedback on these ideas is provided in the table below.

1 – Fund the Healthier Hospital Initiative	
Summary	**Feedback**
While the HHI is a good umbrella organizing entity for the greening of healthcare organizations, it has a number of weaknesses that need to be addressed through a combination of resources and strategic alliances.	• Good cohort of leading systems engaged and a good vehicle for engagement (over 800 hospitals engaged), with energy efficiency a part of their strategy. • Not strongly enough focused on energy efficiency – EE is only one of six actions; and the targets for energy savings are too low. • Not enough accountability for action – level of engagement tends to be low.
2 – Form a New Mission-Driven ESCO	
Summary	**Feedback**
An interesting idea, but one that has many business challenges and would require significant risk capital. The logical first step would be to do a more detailed market analysis.	• A new customer-focused ESCO could bring some transparency to the overall ESCO market and could address the lack of capacity to develop projects for financing. • Many healthcare organizations have had negative experiences with ESCOs. • The idea requires large capital investments and deep management expertise to achieve any scale; and we don't know enough about the market demand and financial feasibility of the idea.
3 – Establish the Healthcare Carbon Footprint	
Summary	**Feedback**
Carbon footprinting is not yet high on the strategic agenda of the healthcare sector and would most make sense as a later strategy.	• Over 60% of the healthcare carbon footprint is in purchased goods and services. There are huge opportunities to reduce emissions in this area that could exceed the gains from energy efficiency. • Reduction of carbon footprints is not yet a strategic priority for most health organizations. • Additional information on carbon footprints is unlikely to lead to behavior changes.
4 – Prepare the Business Case for Energy Efficiency Investments	
Summary	**Feedback**
A high priority for most healthcare institutions that should be integrated into a more comprehensive approach to energy efficiency research for the sector.	• A very high priority for many of the interviewees. • While there is much general information, the specificity of the data and research need to be more granular and tailored to specific contexts; proven and practical solutions are key – not theory and hypotheticals. • The business case needs to address a range of patient-related outcomes, not just energy and cost savings. A more comprehensive and inclusive approach works best in healthcare.
5 – Explore TA Options for Clinics, including ESCO Research	
Summary	**Feedback**
More market research is needed to be able to decide if this is a good course of action.	• See ESCO feedback comments.
6 – Develop the Design for a Baseline Study of Healthcare Carbon Emissions	
Summary	**Feedback**
A good long-term idea but not a	• See carbon footprinting feedback comments.

current priority for most institutions.	

Recommendations to Funders

First Priority Recommendations

1. **Frame opportunities for energy efficiency gains in the broader context of the healthcare industry as a potential leader in creating a low carbon future.** The large opportunity for impact on greenhouse gas emissions is in leveraging the transformation of healthcare to position the sector as a leader in creating "low carbon pathways of care" that simultaneously reduce costs, prevent disease and support healthy communities. Building energy efficiency gains are then one part of this overall movement in which healthcare institutions become active anchors for sustainable and healthy communities.

2. **Convene initiative leaders to agree on a common strategy for market development.** There are a wide variety of existing initiatives with different strengths and roles. The key players do not yet share a strategic approach that is driven by the customer perspective. Funders should support a process to help the key players come to agreement on a plan for a more coordinated approach to market building before making major investments in any one initiative.

3. **Support place-based peer networks as part of the Healthier Hospitals Initiative.** Boston and Chicago have developed good templates on how to organize place-based best practice networks among CEOs and facility leaders. Funders should consider supporting additional networks in other major population centers using an RFP process based on the work in Chicago and Boston.

4. **Invest in the expansion of Green Revolving Funds (GRFs) for the healthcare sector.** There was very strong agreement on the potential for Green Revolving Funds to grow the availability of capital within the sector for energy efficiency investments. Funders should support an expansion of GRFs in the healthcare sector similar to the Billion Dollar Challenge in the higher education sector being led by the Sustainable Endowments Institute.

5. **Invest in an institutional capacity to coordinate energy related research for healthcare.** The Center for Health Design has demonstrated the ability to use disciplined research collaboratives to drive changes in building design standards and practices that affect patient outcomes. It took them over a decade to build the right infrastructure to make this change happen. A similar level of effort needs to be made to organize the research related to energy consumption and emissions (and associated patient outcomes) within the industry. This will enable the industry to systematically build the business case aligning energy consumption and emissions reductions with the healthcare mission. Collaboration between the Center and Health Care Without Harm's Research Collaborative could serve as the foundation for this work. A key part of this work should be a project to get consensus on how to change industry ventilation standards to reduce their energy intensity while maintaining effective infection control.

6. **Work with the federal government to develop green building standards for federally qualified community health centers and other clinics funded by CMS.** The build-out of health clinics under healthcare reform represents an opportunity to influence the energy efficiency of millions of square feet of NEW clinic space. Funders could support a collaborative project with the Centers for Medicare and Medicaid Services (CMS) to figure out how to create incentives for clinics to embed energy efficient design characteristics into clinics that receive federal funding.

Second Priority Recommendations

1. Build the energy efficiency skill level of building management professionals within the industry.
2. Convene U.S. medical equipment manufacturers to improve the energy efficiency of medical devices.
3. Support utility best practice networks for healthcare energy efficiency.
4. Conduct market research and due diligence on the mission-driven ESCO idea.

2. Project Purpose and Process

This report presents recommendations on potential high impact philanthropic investments to advance deep building energy efficiency improvements at scale within the healthcare sector. It is one of five reports being developed for a coalition of six philanthropies that are collaborating to see what they - and others - might do to rapidly increase and scale the energy efficiency retrofit market for buildings in the United States. These philanthropies are the Doris Duke Charitable Foundation, Energy Foundation, Kresge Foundation, Living Cities, MacArthur Foundation and Rockefeller Foundation. Several other foundations are informally following the insights obtained from this effort.

The other sectors for which market development strategies are being developed include: commercial office, commercial retail, single-family residential, and multifamily residential.

This coalition of funders has been collaborating on the Building Retrofit Industry and Market (BRIM) development project for over three years. The first phase of the BRIM project involved synthesizing existing information on size and market dynamics of various sub-segments of the building market. Based on this analysis, the funders identified these five sub-segments as having a high potential for impact. In the summer of 2012, expert panels of 10-12 individuals were convened for each sub-segment. These panels developed recommendations on priority approaches and research needs for each sector.[3] The recommendations in this and the other segment reports build upon these initial ideas.

The process used to develop these recommendations included the following steps:

- Key leaders in building energy efficiency for the healthcare sector were identified.
- Phone interviews were conducted with 33 individuals.[4] They represent a range of players in this market, including facilities management professionals from large health care systems; professional and trade associations; NGOs; funders; utilities; and service providers to the industry.
- Background research was conducted on energy efficiency strategies for the health care sector and a compendium of relevant papers was compiled.
- The final report and recommendations were developed based on the interviews and background research.

The funder coalition will be meeting in February 2013 to review the strategy recommendations for each of the five target sectors and decide on next steps.

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[3] A recent report was issued on the recommendations of all the expert panels: "*Report on Expert Recommendations to Increase the Pace and Scope of the Building Market*", October 2012, James L. Wolf.

[4] See **Attachment 1** for list of individuals interviewed. See **Attachment 2** for the interview guide. It should be noted that while the interview guide had a set of structured questions, the interviews were relatively brief (one hour or less) and covered a wide range of issues. Not all interviewees responded to all the questions. A priority was placed on getting the interviewees point of view on the sector and the highest leverage opportunities, regardless of the expert panel recommendations.

3. Healthcare Sector Strategic Context and Market Dynamics

3.1 – Structure of the Healthcare Sector

The healthcare sector comprises establishments engaged in the direct treatment of individuals for medical conditions. The two primary categories of buildings are inpatient care facilities (acute care hospitals, community hospitals, rehabilitation hospitals, surgery centers and the psychiatric hospitals) and outpatient care facilities (ambulatory care clinics, doctor offices, labs, etc.).[5] This definition of the healthcare sector does not include the manufacturing of sector inputs, such as pharmaceuticals and medical devices.

- In the US there are 5,795 registered hospitals falling into five categories:

Type of Hospital	Number	Percent of Total
Not For Profit	2,918	50%
State and Local Community Hospitals	1,092	19%
For Profit	998	17%
Federal Government	211	3.6%
Other	576	10%

- Almost all the federal government hospitals are operated by the Veterans Administration (VA), making it the 2nd largest chain in the country with a total of 178 hospitals.
- Approximately 60% of the industry square footage is accounted for by inpatient care facilities, with 40% accounted for by outpatient (clinics).
- Compared to many other industries, the market is relatively fragmented with no individual players controlling any dominant share of the market. In the for-profit segments, the 10 largest chains control 14% of all hospitals in the U.S. In the non-profit segment, the largest player (Catholic Health Initiatives) only controls 3% of the market.
- Healthcare systems tend to be regionally focused in terms of service delivery, with a small number of the larger systems having national reach.
- The community hospital market is highly fragmented. More than two thirds serve a population of less than 50,000.
- The healthcare market is characterized by:
    - A trend towards consolidations with larger systems purchasing smaller systems and independent hospitals being merged with larger systems.
    - A shift of treatment from intensive care facilities to more ambulatory care and home care.

3.2 – Healthcare Energy And Emissions Profile

The healthcare sector is a major component of the US economy and a large user of energy and emitter of greenhouse gas (GHG) emissions. The following data points provide a profile of the role of the health care sector in

> *"Hospitals are among the most energy intensive of all commercial buildings in the U.S. and the healthcare industry as a whole represents a substantial fraction of total U.S. commercial building energy use."* (Berkeley National Lab, High Performance Healthcare Buildings, 2009)

[5] The long-term trend in healthcare points to a higher percentage of services being provided in outpatient facilities.

energy consumption and greenhouse gas emissions.

- The healthcare sector accounts for 17% of the US GDP and expenditures of over $2 trillion a year. The US spends 2.5 times as much on healthcare as the average OECD country on a per capita basis.[6] By 2020, healthcare could account for one-fifth of US GDP.
- A 2009 University of Chicago study estimated that the healthcare industry accounted for a total of 8% of US carbon emissions.[7] (This included manufacturing of inputs to the sector, such as pharmaceuticals and medical devices.)
- A comprehensive carbon footprint analysis of the National Health Service (NHS) in the UK found that building energy use accounted for 18% of the system's total footprint, with 65% of the footprint accounted for by procurement (purchased goods and services).[8]
- Healthcare facilities consume 4% of the total energy consumed in the US. (EIA)
- The typical hospital spends 2%-3% of its operating budget on energy. On a square foot basis, energy costs have increased by well over 50% in the last decade.[9]
- Hospitals are 2.5 times more energy intensive than the average commercial office building, producing more than 30 pounds of CO2 emissions per square foot. (USDOE)[10]
- Nationally, the healthcare sector has 129,000 buildings covering 3.2 billion square feet of space.
- While inpatient facilities (primarily hospitals) account for only 6% of the total buildings in the healthcare sector, they account for 60% of the square footage and 80% of the energy consumption.
- The Energy Use Intensity (EUI)[11] for inpatient facilities is 249, compared to 95 for outpatient facilities.
- The average margin for healthcare facilities is a little over 5%. This means that each dollar saved through energy efficiency is the equivalent of $20 in new enterprise revenue.

3.3 – Key Challenges to Energy Efficiency in Healthcare Facilities

The healthcare sector faces some unique challenges to improving the energy efficiency of its building stock. These include:

- **Low Strategic Priority.** Healthcare is a life and death business that is operating in a very turbulent business environment. The culture in the institution is to defer to the needs of the clinical medical staff and assume that existing practices are needed for patient safety. Energy management is typically not seen as a strategic activity and upper management is focused on large issues like profitability, clinical care changes and healthcare reform.

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[6] http://www.cfr.org/health-science-and-technology/healthcare-costs-us-competitiveness/p13325

[7] http://www.uchospitals.edu/news/2009/20091110-footprint.html

[8] *NHS England Carbon Footprinting Report*. London, National Health Service / Sustainable Development Unit, 2008.

[9] http://www1.eere.energy.gov/buildings/energysmarthospitals/m/bottom_line.html

[10] Key factors that drive this higher energy intensity include: 1) 24/7 hours of operation; 2) use of energy intensive special equipment; and 3) higher HVAC costs due to regulations requiring high levels of air exchange.

[11] Energy Use Intensity (EUI) is defined as the annual kBtu per square foot.

- **Energy A Small Part of Operations.** In the typical hospital, energy costs account for between 2%-3% of total operating costs, making it a less than central concern for hospital administrators.[12]
- **Risk-Adverse Culture.** The management culture of the healthcare sector is very conservative. It is difficult to generate a sense of urgency in making changes in operating procedures to reduce energy consumption and emissions. And there is a low tolerance for experimentation with new technologies.
- **Reduced Facilities Staffing.** Hospitals are being subject to intensive cost reduction pressures and in many instances this has resulted in substantial reductions in the facilities management staffing. This makes it more difficult to develop and implement energy efficiency measures.
- **24/7/365 Operation.** The continuous use of facilities makes management reluctant to engage in retrofit activities that could disrupt operations. In addition, renovation projects run the risk of generating dust and other contaminants that create infection control challenges.

> *"They [retrofits] can be very disruptive in operations, particularly in a hospital with infection control requirements and 24/7 operations. It is very painful to do some of those things. Where are you going to go and relocate a whole floor of a hospital?"*

- **Need for Backup Systems.** Because hospitals are engaged in activities that involve the life and death of patients, their margins for error or system failure are very low. As a result, hospitals must have back up power generation capabilities and be able to continue operations in the event of commercial power interruptions.
- **High Variations in Space Use.** While in many building types (such as residential or commercial office) the nature of space use is highly consistent from room to room and building to building, healthcare facilities include multiple kinds of highly specialized space uses where the building energy requirements vary from space to space – such as surgery/operating rooms, patient rooms, intensive care, morgues, labs, waiting rooms, and offices. Each space has different air pressure, ventilation, temperature and humidity requirements. In addition, it is not atypical for the use of a space to change substantially over its lifecycle.
- **Strict Air Quality Regulations.** Medical facility ventilation systems are regulated and managed in ways that dramatically increase the energy intensity of these systems compared to traditional commercial buildings. These requirements include:
    - High outdoor air delivery rates
    - High overall air exchange rates
    - Air dehumidification requirements, which results in air cooling and then reheating
    - High air filtration requirements
    - Higher than normal air temperatures for inpatient rooms
    - Intensive lighting requirements that generate excessive heat
- **Some New Practices Increase Energy Intensity.** Several trends in healthcare are tending to increase the energy intensity of its practices, including increased use of energy intensive equipment such as CAT scans and MRIs, and increased data center requirements due to the implementation of Electronic Medical Records and the storage of large medical imaging files.

> "*With the exception of hospitals built in the last 5 years, every hospital's had amalgamation, multiple systems, and multiple construction periods. We build a hospital and we start cobbling stuff on to it… we add diverse structures at different time periods and they don't necessarily mesh together."*

[12] It should be noted, however, that with an intense focus on reducing costs and eliminating waste under the Affordable Care Act, energy savings becomes more of a high priority for action.

- **Complicated physical plants.** Many healthcare facility campuses consist of a diverse and complex assemblage of multiple buildings with multiple electrical and heating systems, making coordinated energy management a difficult task.
- **Sophisticated Skills Required for Building Management.** Because of the complicated nature of their mechanical and electrical systems, making effective improvements to these systems requires high levels of technical skills and extensive training and experience in building engineers.
- **Separation of Capital and Operating Budgets.** In many instances, the decision-making structures and processes for capital budgets vs. operating budgets are separated. The cost savings of a capital investment in energy efficiency are difficult to recognize in a way that justifies ongoing investments.

> *"These projects are really complicated. And there is a general lack of adequate engineering talent at the hospital level in many of these systems."*

(It should be noted that in the context of these challenges, the recent experience with Hurricane Sandy has highlighted the relationship between energy efficiency measures and climate resilience. As an example, Combined Heat and Power systems have the advantage of both reducing energy consumption and increasing an institution's capacity to operate in extreme weather events.)

3.4 – Typical Best Practices in Healthcare

> *"This is a solvable issue – we have examples of people who have done this and gotten big performance improvements across the board with lower costs. We have no excuse not to set the bar high. We have to fundamentally rethink built environments for health care – push the envelope up and out. We have had such a low expectation of what our health care facilities should be. We can't accept this lowest common denominator."*

Despite the challenges, there is a good set of best practices in the healthcare sector that have demonstrated the ability to achieve high levels of energy savings (25%+) in both new and existing buildings. Many of these are similar to best practices in other sectors while some are specific to the operating requirements of healthcare facilities.

In 2010 the National Renewable Energy Lab (NREL) released a report entitled *Large Hospital 50% Savings* that demonstrated the ability for a 527,000 square foot facility to achieve energy savings of between 50% and 60% in all 16 climate zones using a standard set of energy conservation measures. The Targeting 100! project at the University of Washington's Integrated Design Lab demonstrated the ability to reduce energy use 60% in a hospital with existing efficiency technologies.

Attachment 5 summarizes these typical best practices and activities.

While all of these practices are important, it is worth noting one consistent theme that came through in the interviews –that is that there are enormous opportunities for energy savings that require very modest capital investments and instead focus on operations and maintenance to get the building to function the way it was originally designed to. Generally referred to as "retro-commissioning", many interviewees saw this as an unexploited area of opportunity.

> *"It is critical to focus on the operational 'use and abuse' of buildings. The commissioning aspect of buildings is critical. We would all be appalled at the degree to which buildings are*

just not operating at the level they were designed to operate at. We need commissioning and retro commissioning to get them to operate to higher standards. You can get big performance improvements with no retrofitting at all. If we could just get buildings to operate as they should, we would make a lot of progress."

"We find that in so many cases we can do so much with just tuning the buildings. You don't need a big investment."

"At a minimum, we need to get the performance from the building that we paid for, and make sure the staff can turn in that performance day after day."

"Many buildings are never commissioned to begin with and carry that cost for 50 years. We need to remember that health care involves lots of space changes – we change how rooms are used but the HVAC and lighting systems aren't that flexible. Even if initially set up correctly, it doesn't last with reconfigurations."

3.5 – Current Healthcare Sustainability Initiatives

"The market channels are so many – we talk about this all the time. Don't create new programs to confuse people even more. There are far too many of these efforts out there – they are all well meaning and have a niche but if you are an end user, you are bombarded by these things." (BRIM Healthcare Interviewee)

There is a robust set of initiatives already in place in the healthcare sector designed to advance sustainable/green practices in general and energy efficiency in specific. Any investments in this sector have to be done in a way that complements these existing resources and doesn't duplicate or confuse them. The recommendations in this report make reference to many of these efforts, so a short summary of them is provided in **Attachment 4**. They include:

National NGOs
- Health Care Without Harm
- Practice Greenhealth
- Healthier Hospital Initiative
- Center for Health Design

Federal Government
- Hospital Energy Alliance/USDOE Commercial Building Alliances
- EPA ENERGY STAR For Healthcare
- National Research Labs (NREL, Berkeley)
- Centers for Medicaid and Medicare Services
- Veteran's Administration

Trade, Professional and Standards Setting Organizations
- USGBC LEED for Healthcare
- American Hospital Association (AHA)
- American Society for Healthcare Engineering (ASHE)
- American Society of Heating, Refrigeration and Air-Conditioning Engineers (ASHRAE)
- International Facility Management Association (IFMA) Health Care Institute
- Facility Guidelines Institute (FGI)

4. Priority Approaches for Energy Efficiency in the Healthcare Sector

4.1 – Feedback on the Expert Panel Recommendations

Attachment 3 includes a summary of the three priority approaches recommended by the expert panel. These are:

1. Fund the Healthier Hospital Initiative.
2. Form a new mission-driven ESCO focused on medical clinics.
3. Establish the total carbon footprint of the extended health care enterprise.

A summary of the interviewee feedback on these ideas is provided in the table below.

Fund the Healthier Hospital Initiative		
Summary	**Pros**	**Cons**
While the HHI is a good umbrella organizing entity for the greening of healthcare organizations, it has a number of weaknesses that need to be addressed through a combination of resources and strategic alliances.	• Good cohort of leading systems engaged, and 800 hospitals enrolled as of January 2013. • A vehicle for engagement. • Energy efficiency is part of their strategy.	• Not strongly enough focused on energy efficiency – only one of six actions. • The targets for energy savings are too low. • Not enough accountability for action – level of engagement tends to be low. • Not effective enough without peer learning networks to reinforce actions. • Too aspirational and not enough engagement with the real "nuts and bolts" and the "doers".
Form a New Mission-Driven ESCO		
Summary	**Pros**	**Cons**
An interesting idea, but one that has many business challenges and would require significant risk capital. The logical first step would be to do a more detailed market analysis.	• A new customer-focused ESCO could bring some transparency to the overall ESCO market. • Could address the lack of capacity to develop projects for financing.	• Many healthcare organizations have had negative experiences with ESCOs. • Requires large capital investments and deep management expertise to achieve any scale. • We don't know enough about the market demand and financial feasibility of the idea.
Establish the Healthcare Carbon Footprint		
Summary	**Pros**	**Cons**
Carbon footprinting is not yet high on the strategic agenda of the healthcare sector and would most make sense as a later strategy.	• It could connect energy savings more clearly to the larger issues of climate change. • Over 60% of the healthcare carbon footprint is in purchased goods and services. There are huge opportunities to reduce emissions in this area that could exceed the gains from energy efficiency.	• Reduction of carbon footprints is not yet a strategic priority for most health organizations. • Carbon footprinting is not effective if it is not tied to very specific incentives and actions for reduction. • Additional information on carbon footprints is unlikely to lead to behavior changes.

Healthier Hospitals Initiative

Attachment 9 provides a one-page summary of the Healthier Hospitals Initiative (HHI). It is an umbrella campaign to engage hospitals in one or more of six actions to improve their sustainability. The idea behind this as a priority recommendation of the expert panel is that it is a pre-existing initiative that already has over 600 hospitals engaged in it.

One of the six challenges is focused on Leaner Energy and involves reporting of energy consumption using ENERGY STAR's Portfolio Manager tool, and committing to energy reduction goals of 3%, 5% or 10%.

Attachment 6 includes detailed quotes from interviewees on their feedback on this recommendation.

Mission-Driven ESCO focused on Clinics

The non-profit ESCO idea is largely patterned after the New York City Energy Efficiency Corporation (NYCEEC) that is a public sector ESCO-like entity design to catalyze efficiency investments in the NYC market. It was capitalized with a combination of EECBG, ARRA and private philanthropy capital.

Attachment 6 also includes detailed quotes from interviewees on their feedback on this recommendation.

Healthcare Carbon Footprint

This recommendation of the panel was modeled on the work done in the UK by the National Health Service, which did a detailed full carbon footprint analysis of NHS. The key finding of the analysis was that 65% of the sector footprint was in the indirect value chain – purchased goods and services. A surprisingly large percentage of this footprint came from the energy intensive pharmaceutical sector. Buildings accounted for 18% of the total footprint (or about 50% of direct carbon emissions).

Attachment 6 also includes detailed quotes from interviewees on their feedback on this recommendation.

4.2 – Other Approaches Suggested By Interviewees

There were several additional ideas that were suggested by interviewees that warrant consideration. These are summarized below.

Support place-based peer learning networks for the health sector.

> *"We should be supporting regional leadership networks where CEOs and other leaders can connect with each other. They won't listen to me – they will listen to their peers. They typically "get it" when they connect with one of their peers."*
>
> *"The peer networks have worked pretty well. When they meet on a regular basis, members can share resources with each other and help each other navigate the complexities of negotiating with utilities or implementing SEMPs [Strategic Energy Master Plans]."*

There are several regions where place based peer networks have been developed that serve to accelerate energy efficiency best practices among health care institutions. Two examples are the Chicago Green Healthcare Initiative and the Boston Green Ribbon Commission's Healthcare Working Group. Both of these networks have 15-20 health care organizations involved and engage in common kinds of practices, including:

- Periodic meetings to exchange best practices.
- Development of common tools and materials.
- Voluntary sharing of energy data through Portfolio Manager and other data management platforms (the Boston network has 65 hospitals voluntarily sharing data through Portfolio Manager).
- Collaboration with utilities on connecting healthcare organizations to utility incentives.
- Engagement of local healthcare organizations with the goals and initiatives of municipal climate action plans.

Several interviewees noted that place-based peer networking is an important complement to larger national initiatives such as the Healthier Hospital Initiative and the Hospital Energy Alliance.

Implementation of this idea would involve foundations supporting the development of place-based healthcare sector networks in key regions of the country.

Support the development of financing tools such as Green Revolving Funds that turn energy efficiency investments from expenses to sources of revenue.

There was very strong support across a broad range of interviewees for supporting the systematic development of dedicated financing vehicles for energy efficiency investments. While there are many ways to approach this issue (some of which, like commercial PACE financing, require policy actions), the most popular idea in the interviews was the establishment of internal revolving loan funds that direct a portion of energy savings to repayment of the loan and building of the loan fund pool. Many of the organizations interviewed had established or were considering the establishment of such an internal funding source. Comments in favor of this approach included the following:

> *"We need to break down the wall between capital and operating budgets."*
>
> *"We would love to have hospitals use Green Revolving Funds – they could leverage endowments for this purpose. I absolutely see applicability of this model."*
>
> *"We should definitely be figuring out how to expand Green Loan Funds in this sector. I think there is a huge opportunity there."*
>
> *"One reason hospitals don't do ECMs [Energy Conservation Measures] is that as soon as a facility manager implements one, they get their budget cut. So the incentive is very low. We need shared savings models."*
>
> *"The top of the list for me is lifecycle costing and the financing. I do think that the Green Loan Fund structure could work well in health care and I think that life cycle costing has to find its way into how we make decisions. That is what I would push for."*

> *"I am working on getting us to set aside capital for projects with returns of 4 years or less. Or at least get a commitment of a certain amount per year for this purpose – our version of a Green Revolving Fund."*

The Sustainable Endowments Institute (SEI) has pioneered the advancement of Green Revolving Funds (GRFs) in the higher education sector. Some highlights of GRFs in the higher education sector include:[13]

- There are 79 active GRFs in the higher education sector, covering 31 US states and 2 Canadian provinces with a total of $111 million in committed capital
- Almost half (36) of these funds were created between 2011 and 2012
- The funds achieve a median annual ROI of 28%
- 900 energy efficiency projects have been financed through GRFs

> *"Green Revolving Funds overcome the limitations of budgeting energy efficiency projects as expenses, rather than as a low-risk/high yield financing resource. They are transforming energy efficiency upgrades from perceived expenses to high-return investment opportunities."* (Greening the Bottom Line, 2012, the Sustainable Endowments Institute)

Acting on this idea would involve developing and funding a strategy for advancing GRFs in the healthcare sector through:

- Background research on financing in the health care sector
- Outreach and awareness activities
- Direct TA to organizations
- Work on the design of a pooled fund

Work with standard-setting organizations to change the standards on air exchanges and ventilation for infection control that drive massive amounts of energy consumption.

As noted in the section on challenges, regulations related to air quality and infection control drive large amounts of energy use in hospitals. Energy is used to move air and to treat air (including cooling, dehumidifying, reheating, humidifying and filtration). The energy used to accomplish these tasks can be a large percentage of total energy use in a healthcare building. As an example, in one study conducted by the University of Washington's Integrated Design Lab, the reheating of air that was chilled for humidity control amounted to 43% of a hospital's total energy use.[14] A 2004 ASHRAE study found that between 35% and 54% of the annual energy costs of a typical metropolitan full service hospital came from air treatment of one kind or another.[15]

The two major groups that set ventilation standards for hospitals are the Facilities Guideline Institute (FGI) and ASHRAE (American Society of Heating, Refrigeration, and Air Conditioning Engineers). The ventilation standards for healthcare facilities are regulated by the ANSI/ASHRAE/ASHE Standard 170-2008, which covers:

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[13] Greening the Bottom Line 2012, The Sustainable Endowments Institute

[14] Energy Use and Model Calibration Study: Legacy Salmon Creek Medical Center, Vancouver Washington, University of Washington, Solarc A&E, USDOE, NEEA, 2011

[15] Effective Design of Heating, Ventilation and Air Conditioning Systems for Healthcare Facilities, Robert Cox, Hospital Engineering and Facilities Management Magazine, 2004

- Required air pressure in spaces relative to adjacent areas (some are required to be positive, some negative)
- Minimum air changes of outdoor air per hour
- Minimum total air changes per hour (these vary from 6 for patient rooms to 20 for operating rooms)
- Relative humidity
- Room temperature range

Most of the regulations have infection control as their primary objective.

There was a strong consensus of opinion in interviewees (including many who participate in the standards organizations) that alternative approaches to air ventilation could be achieved with little or no impact on patient safety and with major impacts on hospital energy use. Several interviewees had been on benchmarking trips to EU countries and observed air exchange standards that were much lower with no impact on infection control. The quotes below were typical of the dialogue on this issue.

> *"I chair [a standards setting] research group and we have come to the conclusion that we have over regulated hospitals. We need research to validate that the requirements actually bring benefits. I think we have a lot of outdated requirements that are costing us a lot of energy."*
>
> *"I went on a tour of hospitals in Scandinavia – they were putting out documents that indicated they were using 1/3 of the energy of hospitals in the US – 75 KBTU/SF vs. 200. We spent 10 days and toured the hospitals. By code, we use about 6 air changes per hour in patient care and 20-30 in operating theatres. They don't have a code for air exchanges in patient rooms – and were using 2-3 per hour. So our fan energy compared to them is three times as high. This is a huge burden. But our infection rates are almost the same (9% to 10%). They concentrate on infection by contact using things like sterilization gels. I think it is totally worth taking on this issue."*
>
> *"We need adequate research and validation around infection control. Most of what is going on is voodoo – as we like to say, '200 years of progress unhampered by technology and innovation.'"*

Acting on this idea would involve establishing a consortium of players to work with the standards setting organizations to establish new standards that achieve the same infection control outcomes with less energy intensive treatment of air ventilation.[16]

Work with medical device manufacturers and other suppliers to health care to reduce the energy intensity of equipment and inputs.

A significant number of interviewees see the healthcare supply chain as a large opportunity for emissions reductions. As noted above, the UK National Health Service estimated that 65% of its total emissions came from its supply chain, not direct operations. The quotes below are representative of how they see this opportunity:

> *"The piece I would support is mostly procurement. There is a huge opportunity there that is not being leveraged. Kaiser and others have started integrating requirements for their*

[16] A good example of this kind of opportunity is research that was sponsored by Partners Healthcare and Kaiser Permanente on displacement ventilation that led to changes in ASHRAE standards. See: http://www.noharm.org/us_canada/reports/2009/dec/rep2009-12-01.php

> *suppliers. This can have a huge impact on the energy performance of supplier products. There is an incredible amount of waste that occurs in health care. The embedded energy in what they buy is enormous - there is an excess use of disposable products. Everything gets thrown away after being used once. The procurement focus is on cost only. The opportunity for waste elimination and energy savings in procurement is not well understood – it is not in the mindset of the CEOs."*
>
> *"Procurement is a huge opportunity. We need to get hospitals to leverage their suppliers and reduce waste. You can do this by having them work with their Group Purchasing Organizations."*
>
> *"There are enormous opportunities for carbon reduction in the purchasing chain – materials, energy, equipment. The voice of health care can have a huge impact if its buying matched its values and the vision of the enterprise. The whole supply chain is ripe to look at."*

One specific opportunity in the supply chain would involve working with US medical device manufacturers to establish energy efficiency standards for their equipment.[17] Several interviewees saw this as an approachable opportunity that could have long-term impacts. As one noted:

> *"When my engineers are siting on the roof improving the energy performance of our air handling units, we are looking down at the loading docks where they are delivering new medical equipment that is basically wiping all those gains out. There are only 2 dozen or so major equipment manufacturers. There is a tremendous opportunity here. They are already organized in the EU and developing voluntary guidelines and standards. It wouldn't take a major amount of effort to organize a dialogue between the health care sector and manufacturers."*

Acting on this idea would require setting up and funding a consortium of healthcare customers, Group Purchasing Organizations, equipment manufacturers and other stakeholders (such as the USDOE) to develop voluntary standards on energy efficient design, manufacturing and use for the US market.

Support the development of training and certification systems to increase the skill levels of facility and building managers.

The availability of the human capital needed to effectively manage new building projects, efficiency projects, and day to day building management is a critical issue in the eyes of most of the facilities management staff interviewed. They are facing several challenges, including:

- Cost pressures are leading hospitals to reduce head count in their facilities staff.
- Existing staff is aging and moving towards retirement. In many cases, they have worked with idiosyncratic building systems for several decades and there is no one to replace them with that historical knowledge.

[17] Working with medical device manufacturers was discussed in the expert panel I the context of seeking an ENERGY STAR rating system for medical devices. It was noted that the EPA has explored an ENERGY STAR program for medical devices but decided the market was not large enough to justify it.

- Building technology is getting more and more complicated and more and more computer-based, and many of the long-term staff have not kept up with the technology changes.

Examples of feedback include:

> *"My biggest issue is the expertise of our people running our plants. We need to have smart young people see this as an attractive career with advancement opportunities. We have a tremendous amount of variability in the skill levels of the people who run our plants."*
>
> *"In areas where we have multiple facilities they are big enough to share energy subject matter experts in their systems. In our smaller markets we might have a 150-bed hospital and it is the only facility. There is often just one person who does everything and they grew up in the facility, coming up through the maintenance and operations classifications. They are not being resourced to keep up with changing technologies."*
>
> *"The number one hospital cost is staff and they have been ratcheting down facilities staff. We have a real challenge on the skill levels of facility staff. Lots of the experienced people came out of the Navy 30 years ago and are now retiring. The average age is really high. If they retire, the new people will just not have the technical skill levels. Plus we are changing the systems and making them more and more complex technologically."*

The professional associations that are most involved in skill development and certification are the American Hospital Association, the American Society for Healthcare Engineering (ASHE) (which is an affiliate of AHA) and the International Facility Management Association (IFMA). Ideas for advancing the skills of healthcare staff included:

- Develop new certifications related to energy efficiency specifically targeted at building level managers.
- Support continuing education for building managers
- Provide scholarships for training opportunities

Other ideas less frequently mentioned.

- Organize healthcare leadership nationally to drive the climate policy agenda.

- Engage with utilities on a national basis to coordinate best practices on healthcare energy efficiency, including removing regulatory barriers to Combined Heat and Power and Distributed Generation projects.

- Develop incentives for energy efficiency through regulatory and payer mechanisms (e.g. the Joint Commission and the Centers for Medicare and Medicaid Services).

> *"In health care, the biggest influencers are the regulators. EE is not currently on their agenda but if you could provide evidence of its importance to cost control and health outcomes, they could be swayed."*
>
> *"They (Joint Commission) are independent but not immune from the sentiment of the overall community. My sense is that they would be receptive to changes if they could be demonstrated to have impact. But I don't see them as being an advocacy group."*

- Develop a climate commitment for healthcare institutions similar to the American College and University President Climate Commitment (ACUPCC) in higher education.

- Subsidize ASHRAE audits for hospitals.

5. Energy Efficiency Research Priorities for the Healthcare Sector

Attachment 3 includes a summary of the three research priorities recommended by the expert panel. One is a new issue and two are directly related to two of the priority approaches. They include:

1. Prepare the business case for energy efficiency investments, including non-energy benefits such as impacts on health.
2. Explore and document financial and technical assistance options for clinics (as a predecessor to a business plan for a special purpose ESCO).
3. Develop the design for a baseline study of healthcare carbon emissions.

The vast majority of the feedback from interviewees related to the first research idea – building the business case for EE investments. There was very little feedback on the other two ideas. In most cases, interviewees reacted to the overall idea and did not differentiate between the implementation and the supporting research.

Interviewee feedback is summarized in the table below. Representative quotes from interviewees are summarized in **Attachment 7**.

Research Priority	Feedback
Business Case	• A very high priority for many of the interviewees. • While there is much general information already, the specificity of the data and research need to be more granular and tailored to specific contexts. • Proven and practical solutions are key – not theory and hypotheticals. A lot of research has been done, but it is not accessible to practitioners. • The research has to address the healthcare regulatory context and risk mitigation against those. • A key organizational strategy is building a "virtuous alliance" between the senior facilities leaders and the CFO and/or CEO/President. • The business case needs to address a range of patient-related outcomes, not just energy and cost savings. A more comprehensive and inclusive approach works best in healthcare. • The work the Center for Health Design has done in building a research foundation for the relationship between the built environment and health outcomes is a good benchmark to look at for energy efficiency research.
Clinic TA/ESCO Plan	• More market research is needed to be able to decide if this is a good course of action.
Carbon Footprint Baseline	• A good long-term idea but not a current priority for most institutions.

The overwhelming majority of interviewees supported the need to have more sophisticated research to support the making of the business case for energy efficiency investments. Key suggestions on how to make this successful include:

- **Make it practical.** Facility managers in particular stressed the need to make the information concrete and practical – grounded in case studies where people had actually made the results happen, not in theoretical studies about what is possible. There is a sense that plenty of general information is available – what is lacking is research that is grounded in practice that is specific, but also capable of being generalized.
- **Make it succinct.** The information needs to get condensed into short, clear and easy to understand cases for specific kinds of investments.
- **Address regulatory compliance issues.** As noted, healthcare is a risk averse and highly regulated environment with much of its energy consumption directly connected to infection control standards. The credibility of the research is critical if it is going to give hospital administrators confidence that it will not result in the organization being out of regulatory compliance.
- **Address benefits beyond energy savings.** There is a strong sentiment that energy efficiency can't be effectively advanced in the healthcare sector in a "single issue" approach that focused exclusively on energy and cost savings. It needs to be more closely integrated in the organization's overall health mission – meaning that some of the non-monetary and health related benefits need to also be quantified.
- **Create an institutional "home" for the research.** Building a credible research base and "knowledge management system" for energy efficient healthcare environments will require a long-term investment; collaboration across multiple stakeholders; and longitudinal research. This can't be accomplished by one-off "projects" and will require some kind of institutional capacity. Several interviewees noted that the model executed by the Center for Health Design is an interesting model to consider for this issue.

The Center for Health Design (CHD) plays the role of "knowledge manager" for the relationship between the built environment in healthcare and health outcomes. (See **Attachment 8** for a one-page overview of the Center.) It was established over a decade ago and has built a strong community of peer stakeholders organized around a rigorous research agenda that is then used to influence standards and practices in the industry. CHD's mission is to "transform healthcare environments for a healthier, safer world through design research, education and advocacy."

"The model the Center has created is pretty simple, but it works:
- *Taking what we know and put it in one place*
- *Identify what research needs to be done*
- *Raise funds for the research*
- *Build the knowledge community*
- *Turn it into something actionable*

Sector research needs a center of gravity. CHD created the center for this work – so the community had a place to come together. In energy efficiency it is has been very disparate and all over the place." (Debra Levin, President, Center for Health Design)

CHD works on the application of "Evidence-Based Design" (EBD) to health care environments. EBD is defined as: *"The process of basing decisions about the built environment on credible research to achieve the best possible outcomes."* In healthcare, EBD is an extension of Evidence-Based Medicine, which seeks to base health care decisions on what is known about the effectiveness of specific treatments. CHD has 23 full and part time staff, running 29 different programs in research, education and advocacy.

The CHD model would be an interesting model to consider as a strategy to build an industry-endorsed research base to support energy efficient healthcare environments.

Other Research Priorities Mentioned in Interviews

The one additional research priority mentioned by several interviewees was the need for better information on the role of "plug load" management in healthcare energy efficiency work. Plug loads refer to energy that is consumed by equipment in the building that is not related to building operations. Typical large categories include medical devices, computers and office equipment. Some organizations have estimated that plug loads could account for as much as 25% of total energy consumption. But as one interviewee noted: *"Plugloads are like illegal immigrants – no one really knows the real numbers. But it could be as high as 30 percent."*

Plug load research should be part of any organized sector energy efficiency research agenda.

6. Sub-Sector Targeting

The primary sub-sector targeting issue in healthcare relates to the relative priority of targeting hospitals and other intensive care treatment facilities vs. doctor offices and clinics. The great majority of interviewees were negative on the idea of targeting clinics, for a variety of reasons, including:

- The energy use intensity is lower (outpatient facilities account for only 20% of energy consumption although they account for 40% of square footage)
- Ownership is fragmented
- Much of the space is leased vs. owner occupied
- Clinics lack much of the staff capacity to implement energy efficiency projects
- Clinics are more akin to commercial office buildings than hospitals in how they use energy

Representative quotes include the following:

> *"You won't get your biggest bang for your buck with the clinics. Perhaps you could look at clinics managed by large systems, but chasing after the other ones is low return. If you look at it from an energy analysis point of view, they are the least energy intensive and smaller in size, and the building code requirements are less stringent."*
>
> *"If acute care hospitals were in great shape, I'd say this was the next thing to go after. But there's so much opportunity with acute care hospitals to move the needle and they have a much more profound impact. Focus on hospitals first where big savings are. Worry about clinics later."*

The potential high leverage opportunity that was noted by a number of interviewees relates to influencing the energy efficiency of the design of clinics in the expected coming wave of construction as the industry shifts from a focus on intensive care environments to a greater proportional focus on ambulatory care settings. This shift is driven by a large number of factors, including cost controls, changes in treatment philosophies and expanded primary care coverage. As one interviewee noted:

> *"There will be a huge build out of the ambulatory care sector (including community health centers) from health care reform. Another 20-30 million people are being covered and a lot will go to the health centers. We need to figure out how to advance good design and green improvements in this build out. It is an additional cost – we need to make the case for why they should pay for the cost up front."*

The key player in this market is the Centers for Medicare and Medicaid Services (CMS) within the Department of Health and Human Services. Executing on this strategy would require a collaborative approach to engage CMS, the community health center market, and A&E firms to get green design standards incentivized in clinic capital outlay budgets.

7. Recommendations on Geographic Targeting

Interviewees recommended a variety of potential criteria for geographic targeting. These are listed in the relative order of frequency of mention.

- Strong local networks exist to advance implementation (examples: Boston, Chicago)
- Presence of an anchor institution that provides sector leadership (example: Cleveland)
- Concentration of healthcare facilities – treatment and academic research (these typically track with major population centers – see below)
- Headquarters concentrations (example: Nashville, TN)
- Above average energy costs (examples: New England, Mid Atlantic and South Atlantic for natural gas and New England, Mid Atlantic and Pacific for electricity)
- Carbon intensity of energy sources (e.g. "dirty coal" regions)
- Good regulatory environments (example: states with high ACEEE energy efficiency rankings such as MA, CA, NY, OR, VT)

Below is some data on major medical markets in the US. (Source: Modern Healthcare web site and ACEEE web site.)

Region	No. of Hospitals	No. of Physicians	ACEEE State Rank
New York City	111	62,920	3
Chicago	75	25,560	14
Los Angeles	91	23,920	2
Philadelphia	52	15,070	20
Boston	24	14,540	1
Dallas	75	12,260	33
Houston	52	12,150	33
San Francisco	43	12,170	2
Baltimore	20	11,046	9
Miami	46	10,348	29
Detroit	34	10,989	12

8. Issues and Themes That Cut Across Multiple Sectors

The table below summarizes the degree to which some of the cross-cutting themes across all the sector panels were mentioned in the healthcare interviews.

Cross-cutting Issue (from Expert Panel Summaries)	Resonance with Health Interviews	Comments
The building market in most segments is still depressed, reducing demand.	Low	Not many comments on the level of capital investment in the sector.
A minimum of 20% of energy savings is readily achievable through retrofits.	High	Many interviewees believe that 30%+ savings are readily available through strategic approaches – frequently not including whole-building retrofits.
There is a compelling need for mechanisms to drive demand such as building ratings, competitions, etc.	High	There are not many external levers to provide healthcare facilities with incentives and rewards for superior energy performance. Most of the incentives are internal.
The non-energy benefits of retrofits need to be quantified.	High	Frequently stressed in interviews, especially benefits linked to patient and population health outcomes.
There is a need for simplicity, packaging and speed in approaches. The "transaction cost" is often too high to justify the effort.	High	This is especially true in healthcare where the technical and logistical complexities of projects tend to be high.
Utilities are a key player in advancing retrofits.	Medium	Mentioned as an important partner where incentives are in place, but high dependent on regional policy variations.
There are significant energy savings that can come from building operations. This requires better training of facilities management staff.	High	This is a big priority with many healthcare players.
There are differences of opinion on the degree to which access to capital is a serious market constraint.	Medium	This varies a lot by type of institution. The key issue is internal competition for capital.

9. Key Organizations

The list of key organizations and their engagement in this sector is included in Attachment 4. Details of their involvement in specific initiatives are provided in the recommendation implementation detail.

10. The Role that Philanthropy Can Play in the Healthcare Sector

Philanthropic organizations have a long history of supporting market development in a wide variety of markets, including affordable housing, development finance, public education, agriculture, manufacturing services, sustainable forestry and others. Typical investments in market building have included:

- **Knowledge Creation.** Research on market dynamics; core technologies; best practices; and benchmarking.
- **Innovation.** Development of new products, services, and technologies that advance the market.
- **Standards.** Creation of policy requirements and industry standards.
- **Institutions, Structures and Networks.** Capacity building for organizations, trade associations, networks and other vehicles for organizing players and collaboration within the market.

Philanthropic funders are often positioned to advance the development of professional practice fields in ways that the players in those fields are not. Some of the unique capabilities of funders include:

- The ability to take a longer time horizon than institutions in other sectors–they are not tied to quarterly profit reports or yearly election cycles;
- The ability to work across multiple structures – playing the role of convener, broker, and networker;
- A willingness to tackle complex issues that do not have easy answers in a way that is often difficult for other organizations with stakeholder pressures;
- A ability to elevate the interests of vulnerable and disenfranchised people, including those of future generations; and
- A capacity to contribute important financial and intellectual resources, which in turn can bring other players to the table.

Funders are already engaged in many different ways in the healthcare energy efficiency and sustainability markets. Many of the organizations and initiatives represented in Attachment 4 have received funding from different philanthropic organizations. In addition, many foundations are engaged in health issues that are not directly connected to energy efficiency, but have the opportunity to integrate energy and climate issues into the broader healthcare reform agenda.

The recommendations in this report are designed to leverage the unique capacity of philanthropic funders across the four core market building activities. This set of relationships is summarized in the table below.

Recommendation	Knowledge Creation	Innovation	Standards	Institutions and Networks
First Priority Recommendations				
1. Frame energy efficiency a broad context of sector sustainability.	X	X	X	
2. Convene leaders on a common sector strategy.				X
3. Support place-based peer networks.				X
4. Invest in expanding Green Revolving Funds in healthcare.		X		
5. Invest in institutional capacity to coordinate energy related research.	X			
6. Develop green building standards for federally funded clinics.			X	
Second Priority Recommendations				
7. Build the energy efficiency skill levels of building managers.				X
8. Convene US medical equipment manufacturers.		X		
9. Support utility best practice networks for healthcare.				X
10. Conduct market research on a mission-driven ESCO.	X			X

11. Recommendations for Funders

The healthcare sector is one of the largest segments of the U.S. economy and a major producer of greenhouse gas emissions. It makes sense as a target for philanthropic investments to reduce energy consumption and GHG emissions. At the same time it is a sector characterized by:

- Enormous market change and demands for cost reductions to improve profitability
- Low cost of energy as a percent of total operating costs
- A conservative risk-averse management culture and high levels of regulation
- Limited external incentives for energy efficient operations
- Many existing sustainability initiatives that are not well coordinated with each other

The following recommendations are made with the knowledge that refinement of them should be achieved through further dialogue with key players in the industry.

These recommendations are designed to accomplish the following outcomes:

- **Leadership.** Align sector leaders and market players around a common strategy for building energy efficiency market development.
- **Financing.** Develop dedicated sources of financing to reposition energy efficiency investment as a high-return investment instead of an expense.
- **Knowledge Management.** Build a sector-based knowledge management system around energy efficiency, renewable energy and GHG emissions reductions.
- **Regulatory Barriers.** Remove regulatory barriers to efficient energy use.
- **Networking.** Support place-based peer networking and learning.
- **Skill Building.** Build the skill capacity within the sector to manage building stock for maximum energy efficiency.

11.1 – First Priority Recommendations

1. **Frame opportunities for energy efficiency gains in the broader context of the healthcare industry as a potential leader in creating a low carbon future.** The large opportunity for impact on greenhouse gas emissions is in leveraging the transformation of healthcare to position the sector as a leader in creating “low carbon pathways of care” that simultaneously reduce costs, prevent disease and support healthy communities. Building energy efficiency gains are then one part of this overall movement in which healthcare institutions become active anchors for sustainable and healthy communities.

2. **Convene initiative leaders to agree on a common strategy for market development.** There are a wide variety of existing initiatives with different strengths and roles. The key players do not yet share a strategic approach that is driven by the customer perspective. Funders should support a process to help the key players come to agreement on a plan for a more coordinated approach to market building before making major investments in any one initiative.

3. **Support place-based peer networks as part of the Healthier Hospitals Initiative.** Boston and Chicago have developed good templates on how to organize place-based best practice networks among CEOs and facility leaders. Funders should consider supporting additional networks in other major population centers using an RFP process based on the work in Chicago and Boston.

4. **Invest in the expansion of Green Revolving Funds (GRFs) for the healthcare sector.** There was very strong agreement on the potential for Green Revolving Funds to grow the availability of capital within the sector for energy efficiency investments. Funders should support an expansion of GRFs in the healthcare sector similar to the Billion Dollar Challenge in the higher education sector being led by the Sustainable Endowments Institute.

5. **Invest in an institutional capacity to coordinate energy related research for healthcare.** The Center for Health Design has demonstrated the ability to use disciplined research collaboratives to drive changes in building design standards and practices that affect patient outcomes. It took them over a decade to build the right infrastructure to make this change happen. A similar level of effort needs to be made to organize the research related to energy consumption and emissions (and associated patient outcomes) within the industry. This will enable the industry to systematically build the business case aligning energy consumption and emissions reductions with the healthcare mission. Collaboration between the Center and Health Care Without Harm's Research Collaborative could serve as the foundation for this work. A key part of this work should be a project to get consensus on how to change industry ventilation standards to reduce their energy intensity while maintaining effective infection control.

6. **Work with the federal government to develop green building standards for federally qualified community health centers and other clinics funded by CMS.** The build-out of health clinics under healthcare reform represents an opportunity to influence the energy efficiency of millions of square feet of NEW clinic space. Funders could support a collaborative project with the Centers for Medicare and Medicaid Services (CMS) to figure out how to create incentives for clinics to embed energy efficient design characteristics into clinics that receive federal funding.

Additional detail on each of these first priority recommendations is provided in Section 12.

<u>11.2 – Second Priority Recommendations</u>

7. **Build the energy efficiency skill level of building management professionals within the industry.** This strategy could involve a number of actions, including: 1) additional research to explore the need for new energy management certifications for facility and building managers; 2) research on industry standards for facility staffing to avoid staffing cuts that cost more than they save over the long term; and 3) scholarships to provide staff access to

existing certification opportunities[18], linked to organizational commitments to hit deep retrofitting energy savings targets.

8. **Convene US medical equipment manufacturers.** Funders could support a project to bring US medical device manufacturers together to develop voluntary standards to reduce the energy consumed by medical devices, similar to the European COCIR Self-Regulatory Initiative (SRI) on Eco Design for Medical Imaging Equipment. This project could include focused plug load studies to better understand the actual contribution of devices to energy consumption and the opportunities for efficiency improvements.

9. **Support utility best practice networks for healthcare energy efficiency.** Utilities are increasingly becoming important players in the energy efficiency strategies for this sector through ratepayer funded incentive programs. Strategically focused utilities are developing segment strategies and key account management systems for targeted sectors, including healthcare. As utilities build their market knowledge, collaboration across service areas could more rapidly spread best practices, including policy changes that are specific to this sector. No best practice sharing network yet exists for this purpose.

10. **Conduct market research and due diligence on the mission-driven ESCO idea.** The next logical step to explore a sector-based non-profit ESCO would be to conduct appropriate market research and due diligence on the potential financial structure of the enterprise, including capital investments required, ownership/legal structure and breakeven analysis. Interested funders could provide capital for this business planning process.

12. Additional Detail on First Priority Recommendations

1. Frame Opportunities For Energy Efficiency Gains In The Broader Context Of The Healthcare Industry As A Potential Leader In Creating A Low Carbon Future

This is less a recommendation for action than a proposed framing that crosses across all the recommendations.

Multiple interviewees reflected the point of view that energy efficiency is best approached healthcare not as a "single issue" but as part of a broader sustainability agenda. Building energy consumption is perhaps 20% of healthcare's overall carbon footprint, with transportation adding another 20% and purchasing being the remaining 60%. A narrow focus on energy efficiency alone could miss the larger opportunities presented by organizing the healthcare sector. If funder interest in energy efficiency is driven by urgency about reducing greenhouse gas emissions and building a low-carbon future, then the transformation of the healthcare sector represents an opportunity to substantially advance the nation's overall sustainability agenda, as that sector moves towards representing 20% of the entire U.S. economy.

- There is a potential opportunity to transform healthcare to create low carbon pathways of care that focus more on preventing disease and supporting healthy

[18] ASHE, ASHRAE, and IFMA are the primary industry players offering certifications in this area.

communities.[19] As hospitals better understand the links between their overall operations and the health of the communities they serve, they can transform their practices and approach to overcome the contradictions of our healthcare system being a "disease treatment system" that is powered by many of the same things – fossil fuels, toxic chemicals and industrial agriculture – that are making people sick in the first place.

- By linking healthcare's energy footprint with its larger carbon footprint reduction and leadership role in society, it could be possible to leverage hospitals and clinics to be pivotal institutions in communities for modeling climate resiliency, mitigation and leadership and educating their employees and patients about how they can be prepared for climate change, mitigate their own impact and get involved in larger societal decisions and policy. **In this context, energy efficiency becomes squarely part of the hospital's social mission, not just a means of cost savings.**
- The Affordable Care Act requires every non-profit hospital to conduct a community needs assessment and align their community benefit programs with these assessments. HCWH and the Catholic Health Association have opened the door with the IRS guidelines to allow programs that address the environmental health of the communities that hospitals and clinics serve to qualify as community benefits.
- The highest aspiration seeks to create an international movement for sustainable healthcare for the 21st century, in which healthcare organizations not only treat illness and disease, but also make substantial contributions to creating communities that generate lower rates of illness and disease, including lower rates of carbon pollution.[20]

We urge funders to keep this broader framing in mind as they approach their work in this sector.

2. Convene Initiative Leaders to Agree on a Common Strategy for Market Development

The good news is that the healthcare sector has evolved to the point where it has spawned a robust set of sustainability initiatives – many of them with a specific energy efficiency focus. There is the opportunity to bring some of the key players together to achieve more strategic alignment, and this opportunity should be seized before contemplating any major new investments in one of the initiatives. There are several categories of stakeholders who should be involved in this process, including:

- Industry and staff leadership from the Healthcare Without Harm initiatives (Practice Greenhealth and the Healthier Hospitals Initiative) and the USGBC.
- Representative of key federal stakeholders, including the White House Council on Environmental Quality, USDOE, EPA Energy Star, and the Department of Health and Human Services (specifically the Centers for Medicare and Medicaid Services (CMS)) and the Veterans Administration.

[19] This was the rationale for the Healthier Hospital Initiative focusing on a broad range of actions (such as leadership, waste, purchasing, food and chemicals) in addition to energy.

[20] Health Care Without Harm has launched a global initiative to advance this vision (www.greenhospitals.net) that includes the National Health Service (Britain), the Indonesia Hospital Association, the Australia Hospital Association, the Thai Ministry of Health, the Chinese Hospital Association, the Mexico City hospitals, and 80 hospitals in Brazil.

- Trade association and professional associations such as AHA, ASHE, FGI and ASHRAE.
- Key healthcare improvement initiatives such as the Institute for Healthcare Improvement (IHI).

Alignment across a diverse set of players like this is never easy, especially when many see each other as potential competitors and the perception is that resources are scarce. Funders who are interested in playing a transformational role in this sector could provide the impetus for this diverse set of players to come together around a shared strategy.

Two good examples of the opportunities that could emerge from this dialogue are the following:

- There could be creative opportunities to create more synergy and alignment between the Healthier Hospital Initiative and the USDOE Hospital Energy Alliance. The strengths of one tend to be the weaknesses of the other. Several interviewees noted that the HEA had a terrific set of members and a very substantive technical agenda, but that the USDOE had consistently failed to capitalize on the opportunity these assets represented. It had provided inconsistent leadership and support and key resource decisions continued to be controlled by the public sector, not industry leadership. On the other hand, HHI has great industry leadership but lacks the same level of technical depth in its participants. Some strategic combination of the two initiatives could provide the "biggest bang for the buck", but that combination would need to be driven by industry leadership.

- The federal government is a major player in the healthcare industry. Public funding for healthcare accounts for as much as 50% of total industry revenue, and most of this comes from the federal government. The key players in this are the CMS and Veterans Administration. Federal Executive Orders have required aggressive greenhouse gas emissions reductions targets for all federal agencies, and rigorous sustainable building standards for all new construction. A dialogue with federal players about how they can drive leadership in the healthcare sector could identify important new opportunities for market development for building energy efficiency. This approach could be supported with the existing initiatives in other federal departments such as EPA and USDOE.

Steps in this process could include:

- Formation of a small design team to scope out the idea
- Identification of the key players
- Framing of the opportunity and phone dialogue with each key player
- Preliminary convening design meeting
- Background research on existing initiatives
- Convening of key players
- Agreement on a shared strategy

3. Support Place-Based Peer Networks as Part of the Healthier Hospital Initiative

Implementation of this idea would be relatively straightforward:

- Document the best practices from Boston, Chicago and other healthcare networks.
- Develop and issue an RFP to fund several additional networks.
- Select applicants.[21]
- Work across regions to encourage cross-network collaboration.

4. Invest in the Expansion of Green Revolving Funds (GRFs) for the Healthcare Sector

The Sustainable Endowments Institute Billion Dollar Challenge seeks to stimulate the creation of $1 billion in GRFs in the higher education sector. With $111 million in committed capital to existing funds, they are more than 10% of the way towards that goal.

The healthcare institutional environment is similar in many ways to that in the healthcare sector. If $1 billion in GRFs capital was developed for the healthcare sector, it could generate over 1 million tons of carbon reduction with each cycle of investment.[22] Assuming a 3.5-year payback, the funds would get recycled approximately every four years, leading to a 3 million ton per year footprint reduction over 12 years.

Developing a strategy for expansion of GRFs in the healthcare sector would require a business plan and strategy with the following phases:

- Conduct background research on financing in the healthcare sector. (SEI already has a detailed Guidebook for the higher education sector, so this work would be designed to adapt that for the healthcare sector.) Some hospitals already employ similar models.
- Conduct outreach and awareness activities for the sector.
- Provide direct Technical Assistance to individual organizations.
- Work on the design of a pooled fund to capitalize GRFs.

All of the funds in the higher education sector are located within organizations and are generally managed as a separate capital account. The idea of a pooled fund would be have a “fund of funds” that could provide startup capital to funds at organizations. A pooled fund could be capitalized with foundation PRI or MRI capital.

In addition to its Guidebook, SEI has developed a Green Revolving Investment Tracking System (GRITS) – software to track individual project results and calculate financial and other returns. It is a version of an “ERP” system for GRFs. This software can be provided at nominal costs to organizations establishing GRFs, providing a ready-made “back office” system for the fund.

The John Merck Fund and the Barr Foundation recently awarded grants to the Sustainable Endowments Institute to work with Health Care Without Harm on expanding their model in the healthcare sector. The Leadership in Energy Efficiency Financing (LEEF) initiative seeks to expand GRFs into several other sectors in New England,

[21] Some preliminary work on organizing additional networks has taken place in Cleveland, San Francisco and Baltimore.

[22] The Massachusetts utility energy efficiency plan assumes it takes on average $900 of investment to reduce one ton of carbon emissions on an annual basis.

including healthcare. LEEF could serve as the foundation of a national platform for GRFs in healthcare.

5. Invest in An Institutional Capacity to Coordinate Energy Related Research for Healthcare

Investing in on-going sector capacity to organize and disseminate peer reviewed research that makes the business case for specific kinds of energy efficiency and renewable energy investments would require a long term approach to knowledge management within the industry. As noted, the Center for Health Design is a good template for how to accomplish this kind of long-term focus that produces results.

This work can build upon the work that Healthcare Without Harm has already done with funding from the Robert Wood Johnson Foundation on the design of a Health Care Research Collaborative.[23] The Collaborative would:

- Develop an advisory structure of experts to identify research priorities and designs.
- Identify academic and other research partners.
- Organize research groups to conceptualize, develop and submit funding applications.
- Develop communications networks and channels.
- Produce an annual report.
- Create a searchable repository of research results.

A specific part of this research initiative should be a research program on how to reduce the energy intensity of ventilation and infection control regulations and practices within hospitals.

6. Work with the Federal Government to Develop Green Building Standards for Federally-Qualified Community Health Centers and Other Clinics Funded by CMS

This is an opportune time to pursue this opportunity. Key implementation steps would include:

- Identify key players in the federal government with influence over this issue and explore their willingness to collaborate.
- Conduct background research on the scope of the opportunity; existing building standards requirements; and opportunities for influence.
- Convene a small meeting of key players (CMS; FGI, ASHRAE, National Association of Community Health Centers) to define the opportunities.
- Develop a plan of action.

[23] The Collaborative design encompassed a broader range of research than just energy efficiency, which as noted makes strategic sense in this industry.

Attachments

1. Individuals Interviewed
2. Interview Questions for the Healthcare Sector
3. Healthcare Sector Panel Recommendations
4. Healthcare Sector Sustainability Players
5. Energy Efficiency Best Practices in Healthcare
6. Interviewee Quotes on Priority Approaches
7. Interviewee Quotes on Research Priorities
8. Center for Health Design Overview
9. Healthier Hospitals Initiative Overview
10. Research Bibliography

Attachment 1 – Individuals Interviewed

First Name	Last Name	Position	Organization	Type
Jerry	Abrahams	Partner	Captona Partners	Investor
Richard	Beam	Director of Energy Management Services	Providence Healthcare	Owner
Dana	Bourland	Environment Program Manager	JPB foundation	Funder
Janet	Brown	Director of Facility Engagement	Practice Greenhealth	NGO
John	D'Angelo	VP Engineering & Facilities	NY Presbyterian	Owner
Ricard	Donnelly	Planning and Development Manager	Vermont Energy Investment Corporation	Utility
Glenn	Fischer	Executive VP	Corporate Realty Design & Mgt Institute	Assoc.
Dave	Fukuzawa	Program Director for Health	Kresge Foundation	Funder
Melissa	Gallagher-Rogers	Director of Market Development	US Green Building Council	NGO
Alexis	Karolides	Principal	Rocky Mountain Institute	NGO
Debra	Levin	President & CEO	Center for Health Design	NGO
Paul	Lipke	Sr. Advisor for Energy & Green Buildings	Health Care Without Harm	NGO
Peter	Locke	President	Terralocke Sustainbility Consultants	Provider
Lorissa	McAllister	President	Environments for Health	A&E
Robert	McCoole	Sr. VP Facilties Resource Group	Ascension Health Care	Owner
John	Messervy	Director of Real Estate and Facilities	Partners Health Care	Owner
Mark	Orlowski	President	Sustainable Endowments Institute	NGO
John	Park	Energy Program Manager	Veterans Administration	Owner
Tim	Perrin	Key Account Manager	Vermont Energy Investment Corporation	Utility
Jamie	Ponce	Chicago City Director	Clinton Climate Initiative	NGO
Bill	Ravanesi	Sr. Dir. Of Healthcare Green Building & Energy	Health Care Without Harm	NGO
David	Reed	Director of Energy Services	Schneider Electric	Provider
Jeff	Rich	Executive Director	GL Envision, LLC	Owner
Kurt	Roth	Group Leader, Building Energy Technologies	Fraunhofer CSE	Provider
Dennis	Smith	Assistant Director of Facility Management	Catholic Health Initiatives	Owner
Tilak	Subrahamian	Director of Energy Efficiency	NSTAR	Utility
Walt	Vernon	Principal	Mazetti Nash Lipsey Burch	A&E
Gail	Vittori	Co-Director	Systems	NGO
Brian	Weldy	VP FacilitiGroup Infrastructure Solutions	HCA	Owner
Alan	Whitson	President	Corporate Realty Design & Mgt Institute	Assoc.
Gervean	Williams	Dir. Financial and Operations Management	National Association of Community Health Centers	Owner
Dale	Woodin	Executive Director	ASHE	NGO
Corey	Zarecki	Dir. Of Engineering & Operations	GL Envision, LLC	Owner

Attachment 2 – Interview Questions for the Healthcare Sector

Interviewee Background

- What is your role in the industry and what role have you played in building energy efficiency strategies?

Priority Strategies for Health Care

- What are the top 2-3 strategies you think could help advance building energy efficiency in the health sector?

- What is your overall reaction to the top 3 approaches that emerged from the sector panel?

Research Priorities for Health Care

- Are there specific areas where additional research is needed to advance building energy efficiency in the health care sector?

- What is your overall reaction to the top 3 research priorities that emerged from the sector panel?

Priority Geographic Markets

- Are there particular geographic markets that – due to the policy climate; the right mix of players; dynamics of the real estate market; etc. – are well positioned to take building retrofits to scale, or to test a particular intervention?

Key Individuals or Institutions

- Are there particular individuals or institutions that are good candidates for playing an active role in promoting the implementation of the approaches you find the most promising?

- Are there other individuals you think it is important for us to talk to in this strategy development process?

Attachment 3 – Healthcare Sector Panel Recommendations

Top 3 Priority Approaches

1 – Fund the Healthier Hospital Initiative (HHI)
Eleven of the largest, most influential U.S. health systems, comprising over 490 hospitals with more than $20 billion in purchasing power, worked with Health Care Without Harm (HCWH), the Center for Health Design and Practice Greenhealth to create HHI as a guide for hospitals to reduce energy and waste, choose safer and less toxic products, and purchase and serve healthier foods. It is an exiting, operational initiative that has energy efficiency as one of its target outcomes. Participants in HHI commit to one of three levels of energy efficiency improvements – 3%, 5%, or 10%. Many hospitals are substantially exceeding these targets. An investment in HHI could help the initiative engage more hospitals and strengthen and deepen the focus on energy efficiency.

2 – Form a New, Mission-Driven ESCO Focused on Medical Clinics
The panel discussed the fact that the needs of clinics are very different from those of large hospitals. They are typically much smaller; have little or no technical staff for energy management; and have difficulty accessing traditional financing, include ESCO agreements. A mission-driven ESCO could bring professional energy management services to this part of the market that currently lacks access to them.

3 – Establish the Total Carbon Footprint of the Extended Health Care Enterprise
This initiative would develop a carbon footprint analysis for the full health care supply chain, across Scope 1, Scope 2 and Scope 3 activities. (A project similar to this was done in the UK by the National Health Service.) It was thought this could help focus attention on the carbon footprint of the health care sector, and lead to the establishment of carbon emission reduction goals that go beyond building energy use. As part of this, the business case for EE from the hospital perspective should be established and documented, and the other benefits in addition to energy quantified, including patient health outcomes; community health impacts; talent attraction and retention; cost savings; etc.

Priority Research Needs

1 – Prepare the Business Case for Energy Efficiency Investments
This research would develop materials that can inform hospital executives and CFOs of the business benefits of energy efficiency investments. Part of the analysis would quantify the non-energy benefits, including patient and community health impacts. Tools that conduct life cycle cost for energy efficiency should be examined and expanded to include relevant non-energy benefits. Plug loads should be carefully examined as part of this business case. Case studies using these new metrics would be developed.

2 – Explore and Document Financial and Technical Assistance Options for Clinics
Existing organizations, such as NYCEEC, the Chicago Infrastructure Bank, and others should be interviewed to understand their capabilities to serve this portion of the health care market and determine how they could be made more easily accessible for use by clinics. If the research concluded it was needed, a business plan to establish a special purpose ESCO would be prepared.

3 – Develop the Design for a Baseline Study of Health Care Carbon Emissions
This research would establish the work plan for the third priority approach.

Attachment 4 – Healthcare Sector Sustainability Players

Player	Roles
Health Care Without Harm	• International NGO that has led the greening of the healthcare sector movement. • Practice Greenhealth (PG) is the membership organization of HCWH. In partnership with the Center for Maximum Potential Building Systems, PG sponsors the Green Guide for Health Care. The Green Guide was the foundation for the USGBC LEED for Healthcare standard. • HCWH, PG and the Center for Health Design sponsor the Healthier Hospital Initiative, a coalition of healthcare systems now representing 600+ hospitals that commit to taking one or more actions to green their organizations.
USDOE Hospital Energy Alliance (HEA)	• HEA is one of several alliances established under the USDOE Commercial Building Alliances initiative. • The HEA has 50+ members that represent 27% of the industry total square footage. • HEA works on a number of goals related to benchmarking and measurement; HVAC systems; lighting and electrical technology; medical equipment and plug loads; and power alternatives.
EPA Energy Star for Healthcare	• Energy Star for healthcare offers a broad range of products and tools to help healthcare organizations improve their energy efficiency, including use of Portfolio Manager; implementation toolkits; ENERGY STAR certification; and performance benchmarking.
National Labs	• The National Renewable Energy Lab (NREL) and the Lawrence Berkeley National Lab manage research projects on high performance healthcare buildings
Centers for Medicare & Medicaid Services	• CMS manages federal healthcare programs that fund a large proportion of payments in the U.S. market.
US Dept. of Veterans Affairs (VA)	• The VA is the second largest single healthcare provider in the country and is implementing aggressive energy efficiency and GHG reduction programs based on EO 13514
American Hospital Association (AHA)	• AHA is the trade association for hospitals and healthcare networks • They offer a number of professional facility certifications, including Certified Healthcare Constructor (CHC) and Certified Healthcare Facility Manager (CHFM)
American Society for Healthcare Engineering (ASHE)	• ASHE is a professional association subsidiary of the American Hospital Association (AHA). • The ASHE E2C (Energy Efficiency Commitment) initiative supports the Healthcare Energy Guidebook • ASHE developed an AHA "sustainability roadmap" documenting 325 Energy Conservation Measures that a hospital can implement • ASHE offers prep workshops for AHA facility certifications
Center for Health Design (CHD)	• CHD is an industry collaborative that advances Evidence-Based Design to improve the link between the design of the built environment and health outcomes.
USGBC – LEED for Healthcare	• Manages the LEED for Healthcare building certification standards
American Society for Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE)	• ASHRAE is a professional association focused on building systems, energy efficiency, indoor air quality, refrigeration and sustainability within the industry. • They publish standards and guidelines; issue professional certifications; provide education and training and advocate for industry standards. • ASHRAE publishes a number of standards and design guides of significance to energy efficiency in the healthcare industry, including ventilation standards and an advanced energy design guide for small hospitals.
International Facility Management Association (IFMA)	• IFMA is the world's largest professional association of facilities managers – 20,000+ members. They have "councils" organized around 15 building segments • The Health Care Institute (HCI) is an IFMA alliance partner organized for the health sector; its role is education, research and networking • HCI manages a Benchmarking 2.0 initiative for hospitals (a joint venture with ASHE) • HCI offers a one-day Finance 101 workshop for facility managers to help them make the business case on energy efficiency investments.
Facility Guidelines Institute (FGI)	• FGI manages and publishes the *Guidelines for Design and Construction Health Care Facilities*. The guidelines are used by 40 states for either healthcare licensing or as the basis for their design construction codes for healthcare facilities.
The Joint Commission	• Formerly referred to as the Joint Commission on Accreditation of Healthcare Organizations (JCAHO), the Joint Commission sets standards for and accredits 20,000+ health care organizations.

Attachment 5 – Typical Energy Efficiency Best Practices in Healthcare

Category	Practices
Leadership Engagement	• Commitment to specific energy and GHG reduction goals • Inclusion of energy/emissions targets in the corporate scoreboard • Funding and support for senior staff for energy and sustainability management
Strategic Energy Management Planning	• Development of a Strategic Energy Master Plan (SEMP) • Development of gap assessments and energy audits to identify opportunities for improvement • ISO 50001 Certification • Internal systems to prioritize and track energy investments • Use of Portfolio Manager and other tools to track energy use • Use of sub-metering and other energy monitoring technologies
Dedicated Financing	• Internal Green Revolving Loan Funds • Standardized ROI and Lifecycle Costing tools • Integration into capital outlay budget cycles • Tracking of project results and ROI • Participation in utility and other energy efficiency incentive and financing programs
Implementation – New Buildings	• Use of green building standards or design guides such as LEED for Healthcare, ASHRAE Advanced Design Guide for Small Hospitals, Targeting 100!, and the Green Guide to Health Care • Use of integrated design processes
Implementation – Existing Buildings	• Retro-commissioning of existing buildings on a regular basis • Development of standardized building operating manuals • Annual building maintenance upgrades • High efficiency HVAC systems, including boilers and chillers • Reduced lighting power densities; day-lighting; occupancy sensors l • Demand controlled ventilation; displacement ventilation • Separation of thermal conditioning from ventilation • Building management systems • High performance windows and glazing • Tighter and better insulated building envelopes • High efficiency fan and pump motors • Occupant behavior change initiatives • Plugload management • Data center management
Implementation – Alternative Energy Generation	• On-site and remote renewables, including PPAs • Combined heat and power • Clean energy grid procurement
Implementation -- Procurement	• Implement energy efficiency purchasing specifications • Implement the Electronics Products Environmental Assessment Tool (EPEAT) • Reprocess and re-sue single use medical devices
Human Capital Development	• Certification programs for facilities and building management staff • Continuing education and participation in professional associations • New employee orientation
Reporting and Recognition	• Annual Sustainability and Energy Reports • Participation in Energy Star for Healthcare • Employee recognition and reward programs

Attachment 6 – Interviewee Quotes on Priority Approaches

Positive HHI Comments

- *"The focus on the HHI is absolutely right. The good thing about this initiative is that the large health systems see themselves as the leaders. And they have critical mass with the leading systems in the country. If you penetrate this part of the market you can move the rest of the market."*
- *"HHI is the major call to action for the industry and is a good place to start."*
- *"We should absolutely invest in the HHI. There is no need to duplicate what is underway already. We have upwards of 600 hospitals engaged and many are identifying the energy challenge. But just because they have signed up doesn't mean they understand the economics. Which is why we need to continue to build the business case."*
- *"My sense is that HHI is the right idea at the right time. It is an entry point into the market. But what is important is that it have more of a sense of peer support and accountability. Participants need to be expected to "show their work". Right now there is not enough accountability. We need peer networks and periodic check-ins. Accountability is the weak part of HHI."*
- *"On a national level HHI is a good strategy – a lot of resonance around the country – I would say that people see value in it and it should be supported. So funding of HHI would be useful."*
- *"I really like HHI as a choice because of the peer-to-peer connections."*
- *"Absolutely we think it is viable approach – is it a seed that can germinate explorations. We feel very positive about developing an on the ground HHI initiative in Vermont. We need to know very specifically which hospital is interested in what issues. If they need consultants, we want to support the hospitals in what they want to accomplish. Identifying the areas they want to work on and help them operationalize it. We can connect them to each other -- play the network broker role."*

Negative Comments on HHI or Suggestions for Improvement

- *"It would be good to have a reporting structure to reinforce peer accountability towards the HHI goals – something where we had to report on our progress."*
- *"I wonder if there were ways to better link successful hospitals with other peers – where hospital administrator to hear how they successfully got this done in their hospitals. Facility managers and hospital administrators. If you don't have the right tools from your administrator, it is hard to get the job done."*
- *"We were first to sign up in all six categories on HHI initiative… we're totally on board. But right now it doesn't have a process or mechanism to get this implemented. It gets them to sign up and put their name down saying they're committed, but how are they actually going to implement it? Do they even know where they're at? Do they even know their energy intensity and what their opportunity is? "*
- *"HHI is good but in a hospital most carbon footprint comes from energy use (80%). HHI focuses on the other 20% - recycling, local foods, low VOC paints, etc. Every dollar spent on funding that (HHI) is not going to lead to very much in actual energy efficiency in the industry."*
- *"It's aspirational on the goals and short when it comes to nuts and bolts of doing it. If goal is to get CEOs to commit to something, then HHI is good, but to actually do EE, if that's the primary goal, this isn't best venue. It is great for speeches and presentations, but when it comes to actually doing the stuff, it leaves you lacking."*
- *"HHI is very commitment focused. But what gets hospitals to move? You need peer-to-peer facilitated exchanges with some outside expertise. The peer support infrastructure is critical. This needs to be combined with HHI."*

Positive Mission-Driven ESCO Comments

- *"I like the non-profit ESCO idea a lot. An ESCO can help implement standardized ECMs and have engineers who can roll it out. Somehow we need to infuse into these companies and hospitals the need to do broad scale retrofits. There is a ton of stuff that can be done without new leading edge technology."*
- *"This is a very intriguing idea. Anything that does turnkey project development and provides some upfront capital is very attractive to us. It would definitely be worth the next level of business plan development and market analysis."*
- *"A high performing non-profit ESCO could bring transparency to the broader ESCO market. Total transparency and a willingness to share the benefits would be distinctive. Maybe you could have them be B-Corp certified."*

Negative Mission Driven ESCO Comments

- *"This could appeal to some members, but at the end of the day non-profits are probably going to use their own capital if there is a good return."*
- *"We worked with JCI for many years and we couldn't get it past our auditing staff. We couldn't clearly classify the expenditures, or get clarity on contract terms such as who owns the equipment, what happens at the end of the contract, etc. Finally the CFO asked, 'Is this a good deal for JCI? If so, why don't we do it?' This is what led us to establish the $50 million Facilities Infrastructure Pool program."*
- *"I have been in this business for 30 years and seen lots of niche ESCOs. I am not sure you can get the scale and expertise to make it successful. We have a unit that does $750 million in energy services contracting business. It is a very difficult business."*
- *"I don't support the ESCO approach at all – I definitely don't like this approach. We have had ESCOs – that approach is really against our culture. If you have ever been involved in an ESCO, the sales up front is full of sizzle and sounds great. But the fact is that once we have actual agreements, we see a big shift –now the ESCO bottom line becomes paramount – how to maximize it to their own benefit."*
- *"The ESCO is an interesting idea, but they have had very mixed results, especially in health care. One of the issues the ESCO model addresses is the lack of expertise in organizations to put the projects together."*
- *"Nonprofits have lower total margin but tend to have very high credit ratings – so our cost of capital is negligible – I would never use an ESCO simply because my cost of capital is half what an ESCO's charge would be. ESCOs might be a good strategy for for-profits but I'd caution not-for-profits that they can leverage their own funds a hell of a lot better from their own bond ratings."*
- *"I haven't seen a lot of good models where they share both the risk and the reward with the hospital. The incentives that are offered don't really resonate that well with our sector."*
- *"Healthcare organizations a lot of the time have trust issues with ESCOs – even if they're telling them the right things they feel like they're being sold [a bill of goods]. They don't know enough about it because it's technical, and a lot of times they get leery."*

Carbon Footprint Comments

- *"I would love to have the full carbon footprint analysis and how it connects to choices on the ground, especially connections with community benefits."*
- *"The piece I would support is mostly procurement. There is a huge opportunity there that is not being leveraged. Kaiser and others have started integrating requirements for their suppliers. This can have a huge impact on the energy performance of supplier products. There is an incredible amount of waste that occurs in health care. The embedded energy in what they buy is enormous that there is an excess use of disposable products. Everything gets thrown away after being used once. The procurement focus is on cost only. The opportunity for waste elimination and energy savings in procurement is not well understood – it is not in the mindset of the CEOs."*

- *"Procurement is a huge opportunity. We need to get hospitals to leverage their suppliers and reduce waste. You can do this by having them work with their Group Purchasing Organizations."*
- *"There are enormous opportunities for carbon reduction in the purchasing chain – materials, energy, equipment. The voice of health care can have a huge impact if its buying matched its values and the vision of the enterprise. The whole supply chain is ripe to look at."*
- *"We hardly talk about climate change. This is not the driver. Cost savings is the driver."*
- *"Climate is not necessarily the right message to affect the behavior of the people who are making decisions. Some of the climate discussion might be better reframed as climate risk mitigation for HC enterprises. This is a very conservative sector and it is slow to change. If you talk about climate change, they glaze over."*
- *"Carbon reduction doesn't have much currency yet. It will gain currency when it is regulated and there have to be documentations and regulations."*
- *"Carbon accounting does have traction – but you need to answer how are you going to help me on this – or are you creating a structure for me to have a measurable impact on it. This should be phase II – follow on after they have a SEMP in place."*
- *"Not a high priority initiative."*
- *"It'd be nice, but after we get some big things out of the way".*

Attachment 7 – Interviewee Quotes on Research Priorities

General Comments on the Business Case Research Idea

- *"The highest priority is materials that energy efficiency advocates can take into the CFO and Finance Committees and justify an ROI-based investment in energy efficiency. How do you change the culture so that these kinds of investment have priority? How do you educate the finance folks in that meeting?"*
- *"The biggest piece for me is building a better business case --- in the language that can sell projects 'up the leadership chain.'"*
- *"The number one priority is building the business case. That means we need to collect data and analyze the before and after. We are doing this in the HHI. The case shows up here and there but the format is not specific enough for the facility leader to carry it into the CFO office."*
- *"The key is an alliance between a motivated and focused facilities leader and a receptive CFO that understands the strategic value of a long-term energy plan. If this relationship is a good one, you can organize investments."*
- *"They might have maintenance guys that understand some of this but they don't know how to put it into a business case format and present it to their executives."*
- *"I agree 100%. For our major construction projects, initially some percent of budgets are added to the project to install renewable energy systems and energy efficient components, but in many cases due to the economics, energy efficient or green products are not being installed even though those products are providing lots of benefits - that cannot be quantified."*

Need Concrete, Succinct and Context Specific Products

- *"What the internal advocates need are short white papers that credibly document the business case for each kind of investment – 3-5 pages at most – that they can take to their CFOs and Finance Committees. The business case is the major way to get traction into action. Otherwise, it doesn't move."*
- *"There are plenty of reports that show the business case at the macro level. But this doesn't drive the C-Suite to act. They need to see the specifics for their hospital context."*
- *"We absolutely need to build the business case. We need the data to show what kind of performance can be achieved in different geographies, scales and types of buildings. We have found in our research that the incremental cost for better building environmental performance is very modest. Of course, it can always end up costing more. You need an integrated team that can control costs. You need to use integrated design techniques up front."*
- *"I don't have time to do the research – I need easy to read and short summaries I can take action on."*
- *"There are a lot of groups out there talking about energy efficiency, but the ability to underwrite or provide funding, or decent research on case studies or examples of proven technologies would be huge. What I need are some proven examples of what people are doing to try to wrestle this problem to the ground."*
- *"Enough research has been done to make the case. We need to get the research to people. I think the value beyond cost savings is really going to be key to hospitals. Then it is a win/win."*

Needs to Address the Business Case for Results Beyond Just Energy Savings

- *"The best strategy that I've seen work in healthcare is to tie it as a mission imperative in the service of patient safety, patient outcomes, and patient experience. If you keep energy as a standalone program it'll never garner visibility or traction. You have to link it to and embed it in the core mission."*

- *"You have to be specific about the non-monetary benefits of energy efficiency – such as better health outcomes and better staff performance."*
- *"At the leadership level, they are more interested in investing in community health, reducing medical errors, improving billings for reimbursement – basic business issues. The needs in those areas are just so much bigger."*
- *"It is important in health care not to pursue energy efficiency, energy performance as a "single ticket" item. We need to be focused on a more comprehensive view of built environment performance that does not accept the 'either/or' idea of tradeoffs. How can we tackle these issues in a holistic way that understands the relationship between the built environment and health outcomes, and looks at the full lifecycle costs?"*
- *"In making the business case – we have to look at the sustainable ROI instead of just the financial ROI. A number of economists have put a monetary value on non-monetary benefits that accrue -- staff productivity; lost days of work; community health benefits."*

Comments Skeptical of the need for Business Case Research

- *"I don't think the panel knew what was available already – everything they asked for is already published. If you go to the Energy Star website for healthcare it tells you exactly how to do it. I won't say that it's not a challenge but I'd also challenge the facilities directors and energy program managers - that's part of their job to be able to make those business cases – if they can't make those business cases then maybe they should look for another job."*
- *"The business case is irrelevant in many instances. No matter how much you add to the bottom line, there are competing priorities for capital. Energy use is often only 1% of the total operating budget. If you make a 10% reduction, you are only saving 0.1% of the budget. It is too small to be important, particularly relative to other problems."*

Attachment 8 – Center for Health Design Overview

Mission

The mission of the CHD is "*to transform healthcare environments for a healthier, safer world through design research, education, and advocacy*." CHD works on the application of "Evidence-Based Design" (EBD) to health care environments. EBD is defined as: *"The process of basing decisions about the built environment on credible research to achieve the best possible outcomes."* In health care, EBD is an extension of Evidence-Based Medicine, which seeks to base health care decisions on what is known about the effectiveness of specific treatments.

Organizational History

CHD was started in 1993. For the first 10 years, it was a very small organization, with only 2.0 FTEs. Their primary work was an annual conference that brought together equipment, material and furniture manufacturers, the architecture and design professions, and health care executives together to share best practices in Evidence Based Design. Debra Levin was the "founding entrepreneur." In 1999 and 2000, the organization began a more aggressive strategic agenda and has now grown to include 23 full and part time staff. The Center is running 29 different programs in multiple content areas. The three primary areas of focus are research, education, and advocacy for standards.

Evidence-Based Design Process

1. Define Evidence-based goals and objectives
2. Find sources for relevant evidence
3. Critically interpret relevant evidence
4. Create and innovate evidence-based design concepts
5. Develop a hypothesis
6. Collect baseline performance measurers
7. Monitor implementation of design and construction
8. Measure post-occupancy performance results

CHD Program Areas

Major program areas include:

- An annual conference and multiple other public events on EBD topics
- An EBD magazine
- The Evidence Based Design Accreditation and Certification (EDAC), which awards credentials to individuals who demonstrate a thorough understanding of how to apply an evidence-based process to the design and development of healthcare settings, including measuring and reporting results.
- An Environmental Standards Council that recommends changes in building standards based on outcomes research.
- The Pebble Project, a research, learning and benchmarking initiative in which members (who pay different levels of membership fees, based on their level of participation) design, implement and assess research projects in a collective peer environment, and with different levels of staff support and input from CHD staff. Participating companies pay up to $40,000 in participation fees, and there are 30-40 ongoing projects at any one point in time.
- The Healthcare Leadership project that provides EBD materials to support healthcare executives make the case for implementation.
- Several award and recognition programs that highlight best practices in EBD.
- Research projects supported by third parties and carried out by the Center.
- The Ripple database, an "open source, searchable database containing useable and relevant information to help you to learn more about evidence based design."

The majority of their revenue is non-grant revenue and comes from a variety of membership and participation fees, as well as their annual conference. The annual conference attracts 3,000 – 4,000 participants.

The Center has had a major impact on how the A&E community, product manufacturers, and health care organizations think about and act on the relationship between the built environment and patient outcomes.

Attachment 9 – Healthier Hospitals Initiative Overview

The Healthier Hospitals Initiative (HHI) is a national mobilization strategy to help hospitals embed sustainability into the culture and daily operations of the hospitals. HHI is sponsored by Health Care Without Harm, Practice Greenhealth, and the Center for Health Design. The leadership of HHI comes from eleven large U.S. health systems representing over 500 hospitals wit more than $20 billion in purchasing power.

Six Challenges

HHI has 6 challenges that participants can sign up for.

- **Leadership and Culture.** Actively engage board, management and physician leadership in the sustainability agenda.
- **Healthier Foods.** Promote healthfulness by increasing access to healthier, more sustainable food choices.
- **Leaner Energy.** Reduce energy use to improve organizational performance.
- **Less Waste.** Implement a comprehensive waste management program to minimize financial, environmental and safety impacts.
- **Smarter Purchasing.** Aggregate the purchasing power of the healthcare sector to accelerate innovation in the supply chain.
- **Safer Chemicals.** Replace products that cause or exacerbate health problems with chemically safer alternatives.

HHI Leaders

Health Systems

- Advocate Healthcare
- Bon Secours Health System
- Catholic Health Initiatives
- Dignity Health
- Hospital Corporation of America
- Kaiser Permanente
- Inova Health System
- MedStar Health
- Partners Healthcare
- Tenet Healthcare
- Vanguard Health Systems

NGO Partners

- Practice Greenhealth
- Health Care Without Harm
- The Center for Health Design

The Leaner Energy Challenge

Within the Leaner Energy Challenge, participants are asked to meet a baseline objective and take on three additional goals.

- **Baseline Objective.** Track energy use and GHG emissions through ENERGY STAR Portfolio Manager.
- **Three Energy Goals.**
  - Level One – reduce energy use by 3%
  - Level Two – reduce energy use by 5%
  - Level Three – reduce energy use by 10%

Participation in the Leaner Energy Challenge involves registering to join the HHI and picking a set of goals. Participants get access to a set of tools, workshops, webinars and networks to support their implementation process. Participants also receive recognition as they hit their challenge goals.

Attachment 10 – Research Bibliography

	Author/Authority	Source Name	Date Published	Brief Description
1	ASHRAE	Advanced Energy Design Guide for Small Hospitals and Healthcare Facilities	2007	Detailed technical guide for building design and construction to achieve energy savings
2	DOE Lawrence Berkeley National Laboratory	High Performance Healthcare Buildings: A Roadmap to Improved Energy Efficiency	2009	Overviews challenges and barriers to energy efficiency retrofits in hospitals and suggested priority activities
3	American Hospital Association - American Society for Healthcare Engineering (AHA - ASHE)	Healthcare Energy Guidebook	2004	Detailed overview of hospital costs and efforts to achieve energy efficiency from 120 hospital data set
4	World Health Organization/Healthcare Without Harm	Healthy Hospitals Healthy Planet Healthy People	2010	Global discussion of potential for green healthcare
6	Electric Power Research Institutes	Trends in Healthcare	1999	A comprehensive guide to the healthcare industry covering hospitals, clinics, senior care centers, and all other healthcare providing services. Contains a lengthy section discussing healthcare providers as electric utility consumers and what their primary needs and demands for energy are
7	Deloitte	Retail Clinics: Facts, Trends, and Implications	2008	Comprehensive analysis of the retail clinic market in the healthcare sector, including market concentration, primary owners, and market trends.
8	HighBeam Business	General Medical and Surgical Hospitals	2012	Comprehensive analysis of the hospital market as a whole, including its size, owners, trends in the market, and current industry challenges
10	Energy Star	Shoot for the Stars: ASHE Looking for the Next 100 Energy Star Hospitals	2010	Economic impact estimates for hospital energy retrofits; overview of industry retrofit demand generation initiatives
11	DOE EERE Building Technologies Program	Building Envelope Critical to High Performance Hospitals	2011	Fact sheet and case study on hospital building envelope technologies
12	DOE EERE Building Technologies Program	Commissioning Existing Hospital Buildings Aids Peak Energy Performanc	2010	Fact sheet and case study on hospital commissioning
13	DOE EERE Building Technologies Program	Hospitals Pulling the plug on Energy Wasting Electric Equipment and Procedures	2011	Fact sheet on hospitals ability to save energy by stopping the waste of power
14	DOE EERE Building Technologies Program	Hospitals Realize Fast Paybacks from Retrofits and O&M Solutions	2010	Fact sheet and case study on energy savings hospitals can gain from operations and maintenance reforms
15	Healthy Building Network	Healthcare Construction Case Studies	2005	Collection of case studies on green hospital construction/retrofits
16	Premier Safety Institute	Leading Your Healthcare Organization Toward Energy Efficiency	2010	Discussion of business case and case studies for hospital energy efficiency
17	Mascaro Sustainability Initiative	Greening Healthcare Facilities Roundtable	2006	Record of a convening that analyzed energy efficiency in healthcare
18	Hoovers, Inc.	Hospitals Overview	2012	Overview of the hospital market including number of hospitals in the US, major hospital operators, and the competitive landscape
19	Hoovers, Inc.	Healthcare Industry Overview	2012	General overview of the healthcare sector including its size, fragmentation, major owners, and competitive landscape
20	GreenHealth Magazine	Commitment to Sustainability	2012	Overview of four architectural design firms that specialize in designing LEED-certified hospitals and healthcare facilities
22	Electric Power Research Institute	Products and Services for the Healthcare Industry	2004	Report details the electricity/equipment needs of healthcare providers in the Carolinas and proposes energy efficient solutions to the problem. Also includes a list of professional organizations that provide engineering/consulting services to healthcare facilities
23	Hospital Energy Alliance	2012 Annual Report	2012	Gives an overview of the Alliance's actions over the past year and highlights possible technological and market solutions to increasing energy efficiency among hospitals
26	Health Care Without Harm	Design for Health Summit for Massachusetts Health Care Decision Makers	2005	Summit paper outlining healthy design criteria for hospitals and recommendations for appropriate retrofits
27	ASHE	ARRA Can Fund Hospital Efficiency Improvements	2009	Fact sheet detailing retrofit programs for hospitals available through the ARRA
28	DOE National Renewable Energy Laboratory	Large Hospital 50% Energy Savings: Technical Support Document	2010	Technical study for energy effiicency improvements in US commercial buildings; energy impacts, and needed capital investment
29	DOE EERE Building Technologies Program	Efficient Hospital Boilers Result in Financial, Environmental, and Safety Payoffs	2010	Fact sheet and case study on use of efficient boilers in hospitals
30	DOE EERE Building Technologies Program	Energy Efficient Hospital Lighting Strategies Pay Off Quickly	2010	Fact sheet, case study, and projections on lighting retrofits in hospitals
31	DOE EERE Building Technologies Program	Hospitals Benefit by Improving Inefficient Chiller Systems	2010	Fact sheet and case study on hospital use of chiller technology
32	DOE EERE Building Technologies Program	Hospitals Discover Advantages to Using CHP Systems	2010	Fact sheet and case studies on hospital use of CHP systems
33	DOE EERE Building Technologies Program	Hospitals Realize Greatest Savings Through Formal Energy Management Program	2010	Fact sheet and case study on potential savings associate with hospitals' use of energy management systems
34	DOE EERE Building Technologies Program	Hospitals Save Energy and Money by Optimizing HVAC Performance	2010	Fact sheet and case study on potential energy savings associated with hospital use of optimized HVAC
38	Practice Greenhealth	Healthcare Renewable Energy Initiative	2011	Brochure which outlines the Healthcare Renewable Energy Initiative, which is a pilot program that seeks to implement renewable energy systems within healthcare facilities
39	Energy Star	Leaders in Healthcare Tap the Power of Superior Energy Management	2004	Basic overview of benefits for healthcare facilities that follow Energy Star regulations
40	Center for American Progress	It's Easy Being Green: Environmentally Friendly Hospitals	2010	Provides a summary of benefits of adopting environmentally friendly practices and provides an example of an energy efficient hospital

SUPPORT

This report was completed with support from:

The Doris Duke Charitable Foundation

The Energy Foundation

THE KRESGE FOUNDATION

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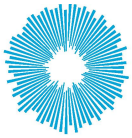

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John D. and Catherine T. MacArthur Foundation

The Rockefeller Foundation