

POWERING THE FUTURE OF HEALTH CARE

PART 2: Thought Leaders Roundtable

Drilling Through the Barriers & Accelerating
CHP Development In Massachusetts Hospitals



Read PART 1 Full CHP Guide pdf (Financial & Operational Resilience)
www.noharm-uscanada.org/PoweringHealthCare

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About Health Care Without Harm

Health Care Without Harm (www.noharm.org) has been in existence for nineteen years. During this period, we have catalyzed a movement “inside” healthcare for environmental health, sustainability and energy efficiency initiatives, and built a web of partnerships that have moved these issues from the periphery to the mainstream of healthcare reform. During this time, we have developed a number of strategies to scale the innovations across the sector. In the spring of 2012, HCWH joined with our membership organization, Practice Greenhealth (www.practicegreenhealth.org), and thirteen large and influential healthcare systems to launch the Healthier Hospitals Initiative (www.healthierhospitals.org), a three-year campaign to enroll up to 2,000 hospitals in at least one of six sustainability challenges (leadership, energy, chemicals, food, waste, purchasing).

Report Authors

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1. Executive Summary

Well-designed Combined Heat and Power (CHP) installations have been shown to significantly reduce energy costs for hospitals while also reducing a facility's environmental footprint. In addition to these benefits, CHP systems that have been specifically designed to support a hospital facility during a power outage can provide critical health and life safety benefits to both existing patients and the wider community. Recognizing these and other benefits, a number of larger hospitals, both in the Commonwealth and throughout the United States, have installed CHP systems.

Despite these significant potential benefits, the hospital CHP market in Massachusetts has grown at a relatively slow pace, especially for small and medium size facilities of around 200-300 beds. **Survey results suggest that hospital decision makers have not found the economics of CHP investments, as presented, to be as compelling when compared to other capital investment opportunities, even after significant utility and state incentives are included .**

In response to these challenges and recognizing the substantial economic and environmental benefits of CHP technologies, Health Care Without Harm (HCWH), an international non-profit focused on accelerating the health care sector's commitment to environmental sustainability, has actively engaged in working with its member hospitals, Massachusetts utilities and state government representatives to drive wider adoption of CHP at healthcare facilities in the Commonwealth. As part of the kickoff for its multi-year CHP strategic initiative, HCWH convened regional and national experts to discuss barriers and opportunities for CHP growth in Massachusetts. Sponsored by National Grid, the Massachusetts Department of Energy Resources, CoGen Power Technologies, Co-Energy America, the Barr Foundation and the Massachusetts Hospital Association, the half-day event provided an opportunity for health care facility leaders, technology vendors, utility representatives and energy efficiency financiers to engage each other in a conversation about innovative approaches to moving the market forward.

In advance of the roundtable, HCWH sponsored a survey of hospitals throughout Massachusetts to gauge their opinions on a range of CHP-related topics. Key findings from the survey included:

- Hospital representatives are generally knowledgeable about CHP technologies;
- Decision makers at health care facilities prioritize financial factors over environmental factors when evaluating energy investment options;
- Hospitals that had evaluated CHP but chose not to move forward with a project typically did so because other capital investment opportunities were perceived to provide greater financial benefits;
- These same hospitals felt that greater utility incentives, system savings guarantees or increased incentives for installations capable of operating during a power outage would make them more likely to install a CHP system.

During the roundtable event stakeholders representing Massachusetts utilities, CHP manufacturers, financiers, hospitals and state government discussed key issues preventing further growth in the market. Some of the most widely cited barriers included:

- Challenges selling CHP technologies to hospital decision makers was identified as a major hurdle;
- Lack of comprehensive long-term strategic facility energy plans that include energy efficiency, CHP and renewable energy opportunities;
- Lack of internal champions for CHP projects;
- A limited number of local firms that had expertise in designing and developing CHP systems;
- Perceptions that CHP installations have not performed as expected in other facilities in the state;
- Limited suitability of CHP for smaller hospitals that do not have sufficient heat load;
- Issues related to the applicability of third-party ownership models to smaller healthcare facilities; and,
- Concerns about the utility interconnection process.

After discussing these and other issues, the roundtable participants discussed potential high-impact solutions to overcome these barriers and concrete next steps that could be undertaken to move the market forward. These solutions included:

- Direct outreach and education to hospital decision makers about the potential benefits of CHP;
- Provide higher caliber technical and financial expertise to hospitals that are interested in exploring CHP installations, particularly in support of competitive procurement processes; and,
- Evaluating the feasibility of aggregating hospital buying power through a coordinated purchasing program.

After these and other potential solutions were discussed, the roundtable participants agreed to create a working group to further refine some of the ideas discussed at the event. A second priority was researching the potential of a CHP bulk buying program. A second group to explore bulk buying will also be convened in the near future.

This document compiles, in further detail, the key outcomes from this session and other activities undertaken as part of this project. The next section discusses key findings from the survey of health care facility leaders and managers. The third section reviews the critical outcomes of the facilitated session. This report includes several appendices that provide additional information developed as part of this project including detailed notes from the facilitated roundtable sessions.

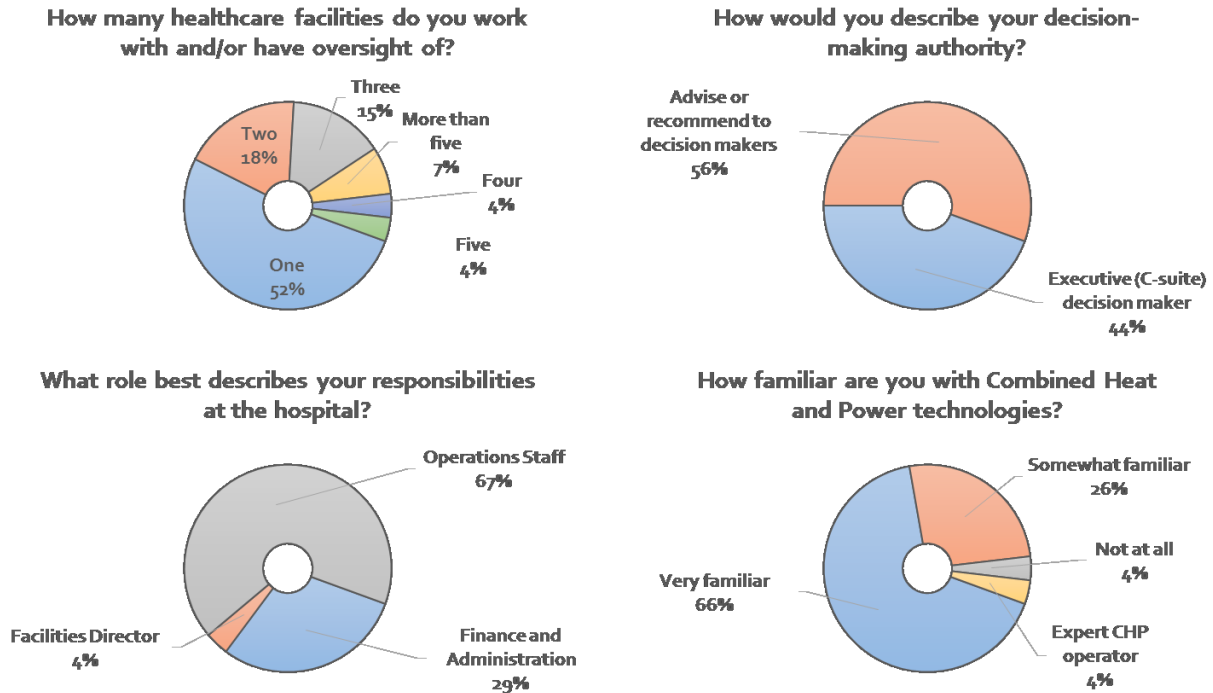
2. Survey Results

An online survey was distributed to the Massachusetts Hospitals Association's membership list. The survey was designed to help better understand how health care facilities view potential CHP investments as well as the broader barriers associated with hospital energy efficiency investment. Twenty-seven healthcare executives and facilities managers participated in the survey. Several key findings are provided below and a full review of the survey results is presented in the appendix of this report.

Survey Participant Profile

Survey participants represented a broad range of health care facility types, from small non-profit organizations with only a single facility to large multi-facility private corporations. Respondents were largely either operations staff or involved in facility finance and administration. Forty-four percent of survey respondents had decision-making authority within their organization while the remaining survey participants advised decision makers. Notably, the majority of survey participants were already familiar with CHP technology. Figure 1 below shows demographic information about survey participants.

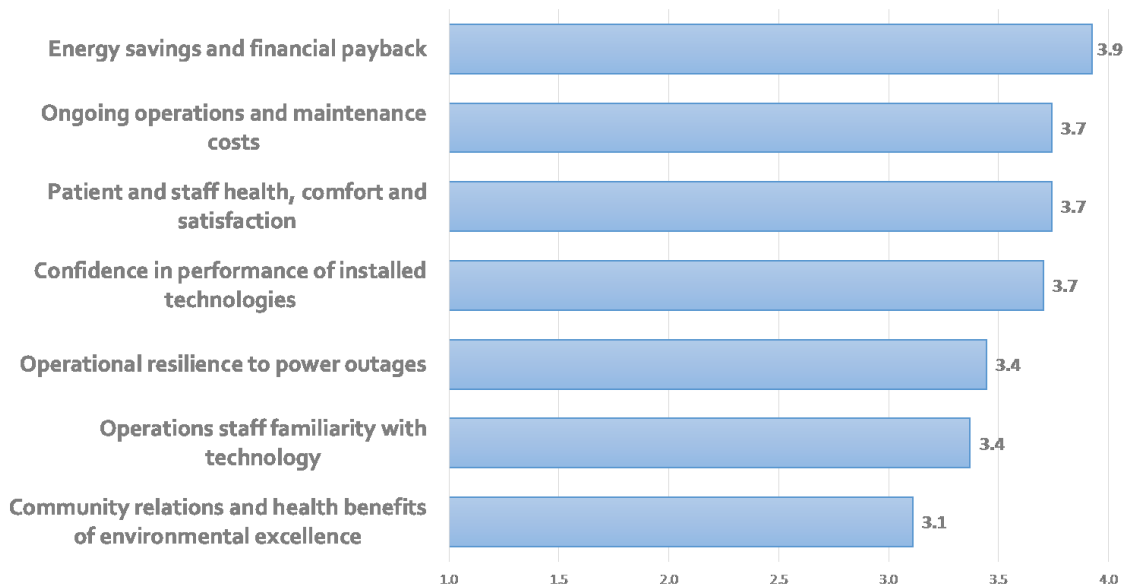
Figure 1. Survey participant demographics



Energy Decision Making

The survey explored how energy savings investments were evaluated and prioritized by health care decision makers. The figure below shows the rankings of different energy efficiency evaluation criteria on a one-to-four scale. As the figure shows, decision makers within the healthcare industry are most concerned with the financial benefits of energy savings investments while issues related to operational resilience and environmental benefits are less of a priority.

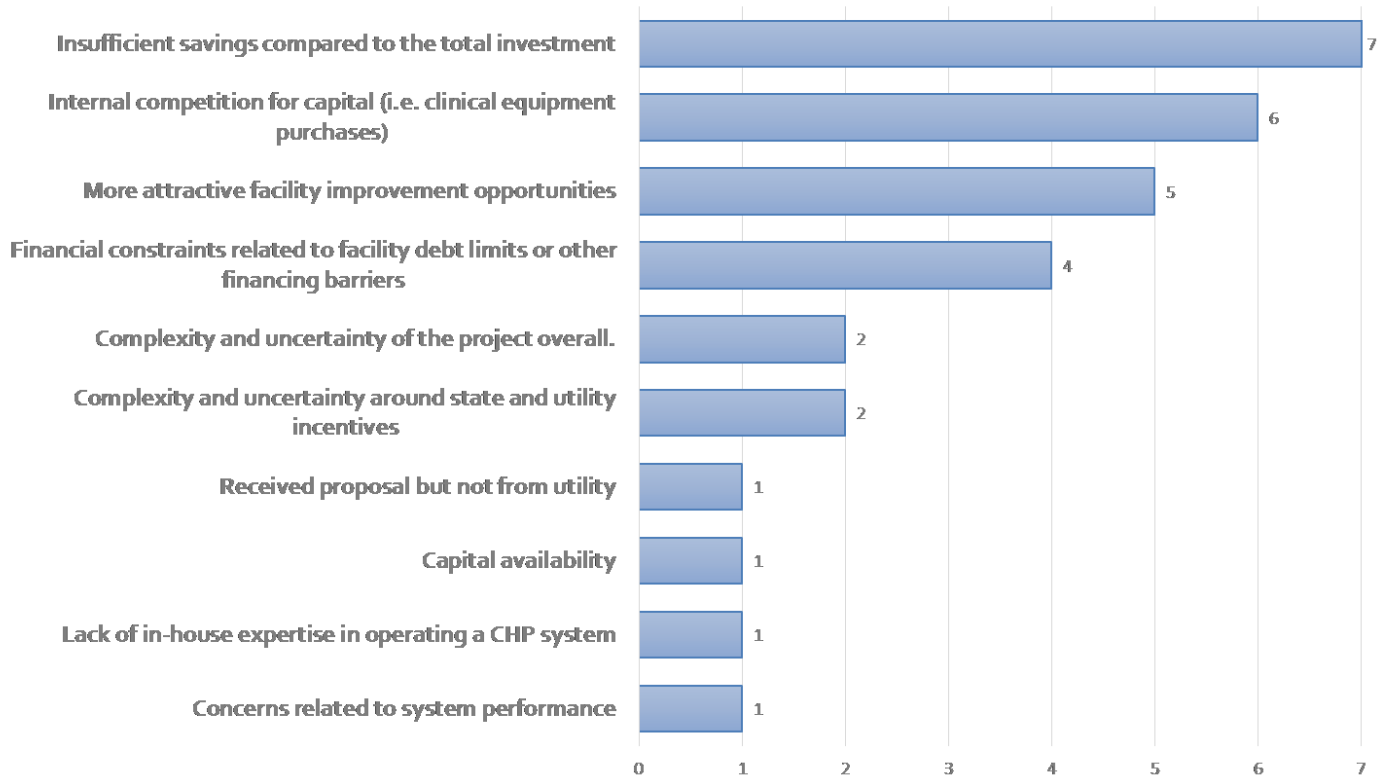
Figure 2. When evaluating energy savings investments how important are the following factors in your decision-making? (4= Most Important; 1= Least Important)



CHP Projects

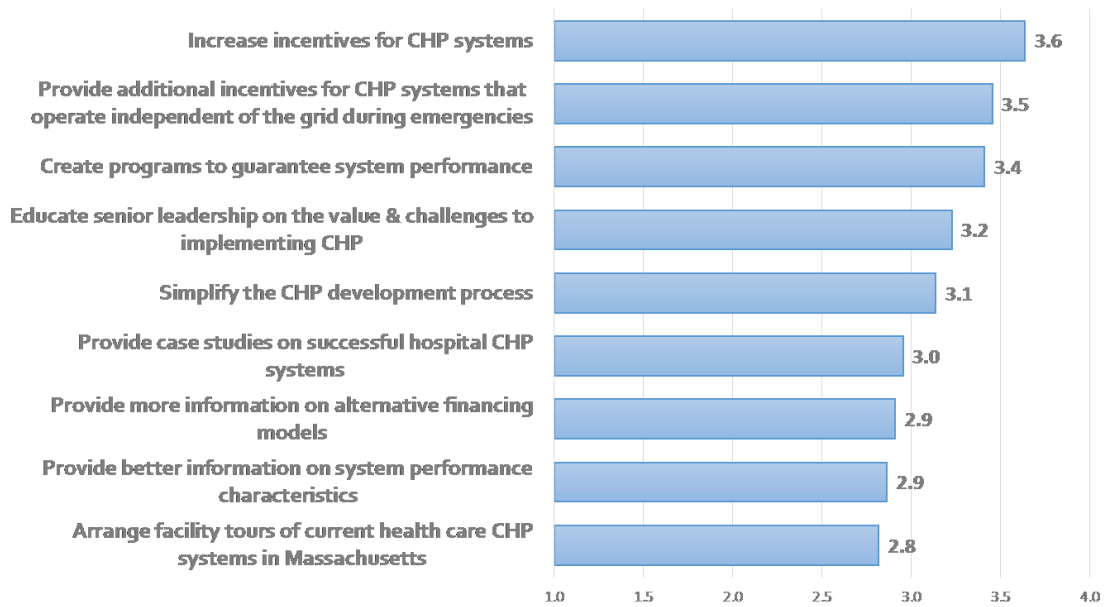
A number of survey respondents have evaluated CHP technologies and received incentive proposals from their utilities to support projects. Despite the potentially attractive returns on these projects, these healthcare facilities have not moved forward with these projects. In order to better understand why these seemingly lucrative projects have not been implemented, the survey asked what major issues prevented the project from moving forward. As seen in Figure 3, the most frequently cited reason for not completing a CHP project were related to financial concerns. As the figure shows, many respondents felt that the financial benefits of the project were insufficient or there were other facility investment priorities that took precedence over the CHP installation.

Figure 3. If you have received a utility incentive offer for a combined heat and power system, but did not move forward with the project, what prevented you from implementing the project?



Survey participants were also asked to provide feedback on how to better incentivize healthcare facilities to move forward with CHP projects. Figure 4 below shows the responses to this question. As the figure shows, respondents ranked increasing incentives and providing added incentives for CHP systems with off-grid capabilities would be the most attractive means of increasing CHP adoption. Survey respondents reported that informational efforts, such as facility tours or case studies would be a less attractive approach to improving CHP uptake.

Figure 4. What additional activities or information could increase the likelihood that CHP would be adopted at your facility in the future? (Most useful = 4; Not Useful = 1)



The survey included extensive questions related to the topics discussed in this section. A full review of the survey results, along with anonymized raw survey responses is provided in Appendix III of this report.

3. CHP Roundtable Event

Health Care Without Harm convened a half-day roundtable event that included CHP industry representatives, utility efficiency program managers, health care facility experts, project financiers and state regulators. The goals of the session were to:

- Come to a consensus understanding of the challenges facing small- and medium-sized hospital with respect to CHP development;
- Identify potential financial, organizational, regulatory and technical solutions to overcome identified hospital CHP development barriers;
- Develop group recommendations.

Thirty four experts were in attendance.¹ The event started with remarks by representatives from both the state (John Ballam of MassDOER) and a Massachusetts utility (John Rathbun of National Grid). Tom Bourgeois, from the U.S. Department of Energy’s CHP Technical Assistance Partnership, also made remarks about the energy resilience benefits of CHP technologies.² A presentation (which is contained in Appendix III) reviewing the full results of the hospital survey was also delivered.

After the presentations, attendees were divided into three groups. Each group was tasked with identifying additional barriers to CHP hospital development and with brainstorming potential solutions to moving more hospital CHP systems to completion. Discussions focused on identifying financial, organizational, technical and regulatory issues and solutions to CHP development. A full review of each discussion section is provided in Appendix I of this report. Key themes discussed in each of the breakout group that were identified for discussion in the larger group are listed below.

¹ A full list of participants is provided in the Appendix.

² Slides from this presentation are provided in the Appendix of this report.

Organizational

Critical organizational challenges identified by roundtable participants included:

- Effectively selling CHP technologies to hospital decision makers was identified as a major hurdle. Stakeholders suggested that:
 - The facility or energy manager is often not sufficiently equipped with the correct language, sales training, and/or position to present a project of such complexity to a hospital's senior leadership.
 - It is critical to present CHP projects in terms that are consistent with terms CFOs and CEOs are familiar with. Hospital representatives at the session with experience pitching CHP projects to decision makers suggested making the comparison between the additional number of patients needed annually to produce the equivalent revenue/savings generated by a CHP project. As an example, hospitals with a 5 percent margin (margins are usually much lower in Mass.) need to bring in \$20 of business to make \$1 of profit. Therefore, saving \$100,000 annually with a CHP plant is equivalent to bringing in \$2 million in new business. This framing can make a CHP investment a far more attractive proposition.³
 - Senior leadership lacks understanding of energy markets and pricing, and they perceive they cannot afford the time needed to learn enough to be informed consumers.
- Lack of comprehensive long-term strategic facility energy plans that include energy efficiency, CHP and renewable energy opportunities were also cited as an organization barrier to major energy-related capital improvements such as CHP.
- Identification and enlistment of internal champions for CHP projects was expressed as critical to the success of moving forward with CHP projects.
- As an established technology, CHP was also reported by roundtable participants as not generating significant excitement or interest compared to newer technologies such as solar PV.

Technical

Several key technical and engineering challenges identified by participants included:

- Roundtable participants noted that there were a limited number of companies in Massachusetts with the expertise to oversee the proper installation of CHP systems.
- Some participants also noted a general distrust of CHP developers among hospital leaders and facility managers based on 1) "too good to be true" suspicions and 2) reputation, since there are a handful of newer hospital CHP installations in the state that have been taken off-line/not functioned well due to poor design, equipment malfunction, emissions issues, etc.
- Another critical technical barrier in hospitals below 200-300 beds is a lack of sufficient year round heat load to support cost-effective CHP installations.

Financial

Financial barriers were a significant focus of several of the small group discussions. Financial issues discussed included:

- Concerns about hospital debt limits preventing investments in capital-intensive CHP systems.
- Issue related to the applicability of third-party ownership models to smaller healthcare facilities.
- Concerns about third-party owners receiving overly generous returns yet an unwillingness of facility decision makers to move forward on projects using their own capital.
- Internal competition for capital and prioritization of projects that were closer to the core mission of the health care facility over energy projects.
- Uncertainty regarding the balance sheet treatment of more innovative financing options such as energy service agreements and PPAs.

³ http://www.energystar.gov/ia/business/healthcare/factsheet_0804.pdf?26dd-883f

Regulatory

Several key regulatory hurdles were identified as priorities by roundtable participants including:

- Creating a more streamlined interconnection process in order to remove uncertainty from the CHP development process.
- Allowing the resilience benefits of island-able, blackstart hospital CHP systems to qualify for new incentives.

A full accounting of the issues discussed in each small group can be found in the appendix of this report.

At the conclusion of the 90 minute small group discussions, the group was reconvened to discuss the key conclusions from each group and to develop next steps and group recommendations. This 45 minute discussion identified a number of key priorities. These key findings are reviewed below.

Outreach and Education of Hospital Decision Makers

Outreach and education of hospital decision makers is key to moving CHP projects forward. The group concluded that outreach to decision makers on CHP could best be done by an organization that is established and trusted within the Massachusetts healthcare community. The Massachusetts Hospital Association (MHA) was identified as the most likely organization to effectively serve this role. Stakeholders also supported the idea that the MHA's annual meeting, where healthcare senior decisions makers meet to discuss issues facing the industry, could be an excellent opportunity to educate hospital CEOs about CHP. Health Care Without Harm will be attending MHA's annual meeting in June 2015, and is working to place utility representatives on an MHA c-suite meeting agenda in the near future.

As part of these outreach and education efforts, participants agreed that identifying successful Massachusetts hospital CHP systems was key to educating hospital leaders. One critical concern mentioned by several stakeholders was the need to get the limited number of new and under-performing CHP systems in the state up and running as soon as possible to address what could turn into a serious potential reputation problem for the CHP industry.

Once target hospitals have been identified, speaking to different professionals within a healthcare facility in the terms that are most relevant to them was also highlighted as a critical element of successfully pitching CHP systems. For instance the most appropriate way to approach a hospital CFO about a potential project will differ markedly from the pitch used to educate a facility operator. In fact, some attendees noted that many facility managers may have trouble advocating for CHP and other energy projects because they do not approach financial decision makers with proposals that speak directly to CFO's primary need or provide CHP system financial information in a context that is easily understood by hospital leaders. Individuals who champion CHP technologies within a healthcare facility may require a coordinated education and outreach effort that assists them in making arguments that are most likely to resonate with hospital decision makers.

The group also recommended that a high leverage, steering group or "rapid response team" should be created to provide outreach and education about CHP technologies to healthcare facilities across the Commonwealth. This group could be empowered to further explore many of the issues discussed at the roundtable.

Supporting a Competitive Procurement Process

Despite the survey results, many hospital facility managers and decision makers are likely unfamiliar with many of the details of CHP system installation and operations. Given these uncertainties, implementing a multi-million dollar CHP project may present a number of real and perceived risks that may be able to be overcome, moving projects forward. One potential avenue to overcome these issues is using a trusted advisor to support the development of CHP projects. Owner's agents with specific CHP knowledge, from engineering and operations to finance and contracting, may be able to support healthcare facilities in competitively procuring projects and avoiding critical pitfalls that can derail projects. Some roundtable participants suggested that having someone assume this role on behalf of healthcare facilities in the state could overcome some of the issues related to decision maker apprehension about moving forward with a CHP project. A state-

wide organization that works with hospitals could explore assuming or contracting with experts to serve this role for its members.

CHP Aggregate Purchasing Exploration

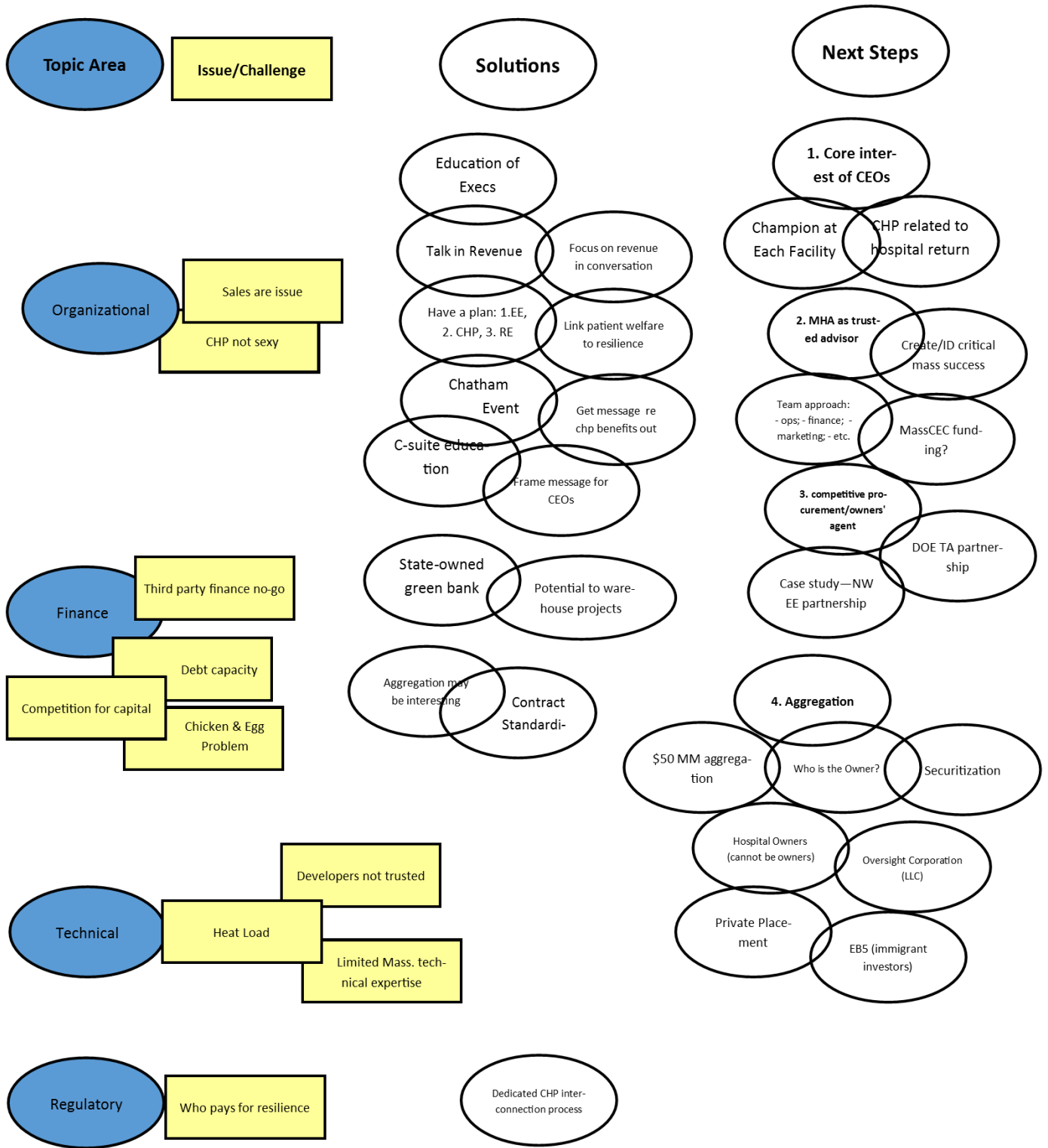
The issue of aggregate purchasing was also discussed with some roundtable attendees feeling the concept had merit while other felt it was not a viable option. CHP aggregation could be structured in a number of ways, from hiring a single developer to serve multiple hospitals in exchange for volume pricing discounts, to aggregating system financing. Many attendees had questions regarding how the mechanics of an aggregation program might be structured. Work to expand on this concept could include:

- Identifying potential sites that could take part in a group aggregation;
- Working with hospitals to scope out potential CHP technology options;
- Researching best practices with regards to CHP third-party ownership models, contracting, financing strategies and other key program elements.

Participants suggested that such an effort would need to be led by a trusted entity with a significant network of healthcare facilities in Massachusetts.

A diagram of the discussion board from the plenary session after solutions and ideas were grouped together is provided below.

Figure 5. Plenary Session Discussion Board



4. Next Steps

Attendees were generally enthusiastic about the prospect of moving forward with coordinated efforts to promote CHP in small and medium healthcare facilities in Massachusetts (notably, the larger Boston area hospitals are already accelerating CHP development). Critical next steps that will be completed in the coming months will include:

- Creation of a working group made up of roundtable participants to further refine the case for CHP adoption. This working group could develop resources and serve as a group of trusted advisors for health care facilities looking to explore CHP installations.
- Research and analysis regarding the viability of collaborative aggregate purchase efforts for CHP technologies. Many of the questions raised about this approach will need further in-depth analysis and vetting in order to develop a viable model that could be implemented across the state. A second group of attendees will convene to develop and implement a research plan around this topic.

These critical next steps, taken as a group, will form the basis of Health Care Without Harm's CHP market development efforts in the coming years. With the support of its partners across the state and in the CHP industry, HCWH hopes these near term efforts will result in a more financially secure, energy resilient health care industry that minimizes its environmental impact while increasing the health and safety of Massachusetts residents.

Appendix I: Small Group Notes

Participants were asked to react to the survey results, and identify and discuss any additional barriers to CHP deployment in small to medium hospitals. Participants provided barriers to CHP deployment in one of four categories: Financial, Organizational, Technical and Regulatory. After these barriers were identified, participants brainstormed solutions, and prioritized issues to raise to the full group in the subsequent plenary session. Notes from each small group activity are provided below.

Small Group A Notes

Participants: Rob Morin (Ameresco), John Ballam (DOER), Chai Tsirisirikul (Partners), Tom Bourgeois (Pace U), Paul Lipke (HCWH), Jose Veiga (National Grid), Jim Ruberti (Eversource), John Moynihan (Cogen Power Tech)

Financial

Barriers

- Lack of trust in third party ownership model
- Hospital credit risk – many Mass. Hospitals currently in the red
- Questions about whether third-party ownership is off-books
- High returns for investors in third-party ownership models – not wanting to share benefits
- Volatility in gas prices and certainty of financial benefits
- Increased investment in additional staff to operate system
- Size limits for third-party ownership (3MW and above is ideal)
- Added costs for off-grid systems

Solutions

- Aggregation of multiple systems in order to create a financeable portfolio of projects was discussed as one solution to financing barriers to CHP systems. This was expected to allow smaller CHP systems to be developed under a third-party ownership model.
- Because some CFOs may be skeptical of third party ownership CHP development structures, it was suggested that ensuring that these structures were correctly framed when presented to decision makers was critical to getting projects to move forward. This solution was specifically targeted to address the issue where CFOs are reluctant to move forward with third-party owned systems because of the high financial returns of the investors, but are still unwilling to move forward with a project using their own balance sheet.
- Have an owner's agent or third-party evaluator assist with procuring and negotiating CHP projects could help overcome barriers related to trusting developers and technology vendors. Using an outside party with specific experience in CHP project development represent hospitals in their CHP development efforts could help alleviate concerns about contracting risk while also helping to facilitate the project development process.
- Minimize the amount that projected savings are discounted based on the perceived risk of a technology which lies outside of the normal experience of CFOs. The recommended approach was to be able to refer to successful projects completed by facilities similar to their own.

Organizational

Barriers

- Facility operators are already swamped with existing responsibilities
- CHP competes with other technologies (e.g. solar)
- CHP pitches not framed to appeal to CFO/CEOs
- Healthcare facilities prefer investing in core service (a.k.a. "The MRI Problem")

- Awareness of CHP is limited
- Adding FTEs to operate is a red flag for management
- Conflicts with existing labor agreements
- C-level resistance

Solutions

- Organize a charrette with high-level hospital leaders to introduce them to the benefits of CHP technology.
- Outsourcing CHP operations to third parties that are responsible for all system performance, eliminating the need to add staff capacity, and/or creating a push for regulatory relief/carve-out
- Utilize APS revenue to cover system operations costs.
- Explore having an energy manager that works at several facilities be in charge of CHP system operations and maintenance.
- Develop long-term multi-year hospital energy plans that sequence 1. Energy Efficiency, 2. CHP and 3. Renewable Energy investments.
- Develop projects under guaranteed savings contracts that protect hospitals from issues related to system performance.
- Ensure that an internal hospital champion has the resources and strategies needed to pitch projects to C-level executives.
- Put CHP savings into a context that CFOs understand. This can effectively be done by comparing the savings generated by a CHP system to the profit generated by a hospital. Many hospitals have very low profit margins (1-2 percent), meaning that significant investments must be made to generate returns. Comparing CHP investments to the equivalent investments needed to generate the revenue/savings by a CHP system may better resonate with CFOs.
- Lead with a discussion on the revenue impacts of CHP investment and also discuss how CHP can reduce a hospital's liability in the event of a long-term power outage.
- Sell CHP as part of a package of measures that create additional savings.
- Present the CHP project to other important audiences such as facility engineering management in terms, can appreciate, using attributes such as reliability, contract maintenance, or flexibly.

Technical

Barriers

- Insufficient heat load at small and medium hospitals
- Measurement and verification of savings and system output
- Properly sizing systems
- Differences between summer and winter load

Solutions

- Pick up heat load from adjacent commercial properties to create 'neighborhood' or microgrid projects
- Explore new technologies that allow back pressure turbines to operate at lower thresholds.
- Create best practice guidance, RFP's etc to ensure confidence in M&V of savings and system output
- Replacement of aging electric chillers with absorption chillers and registering the absorption chillers in the forward capacity market

Regulatory

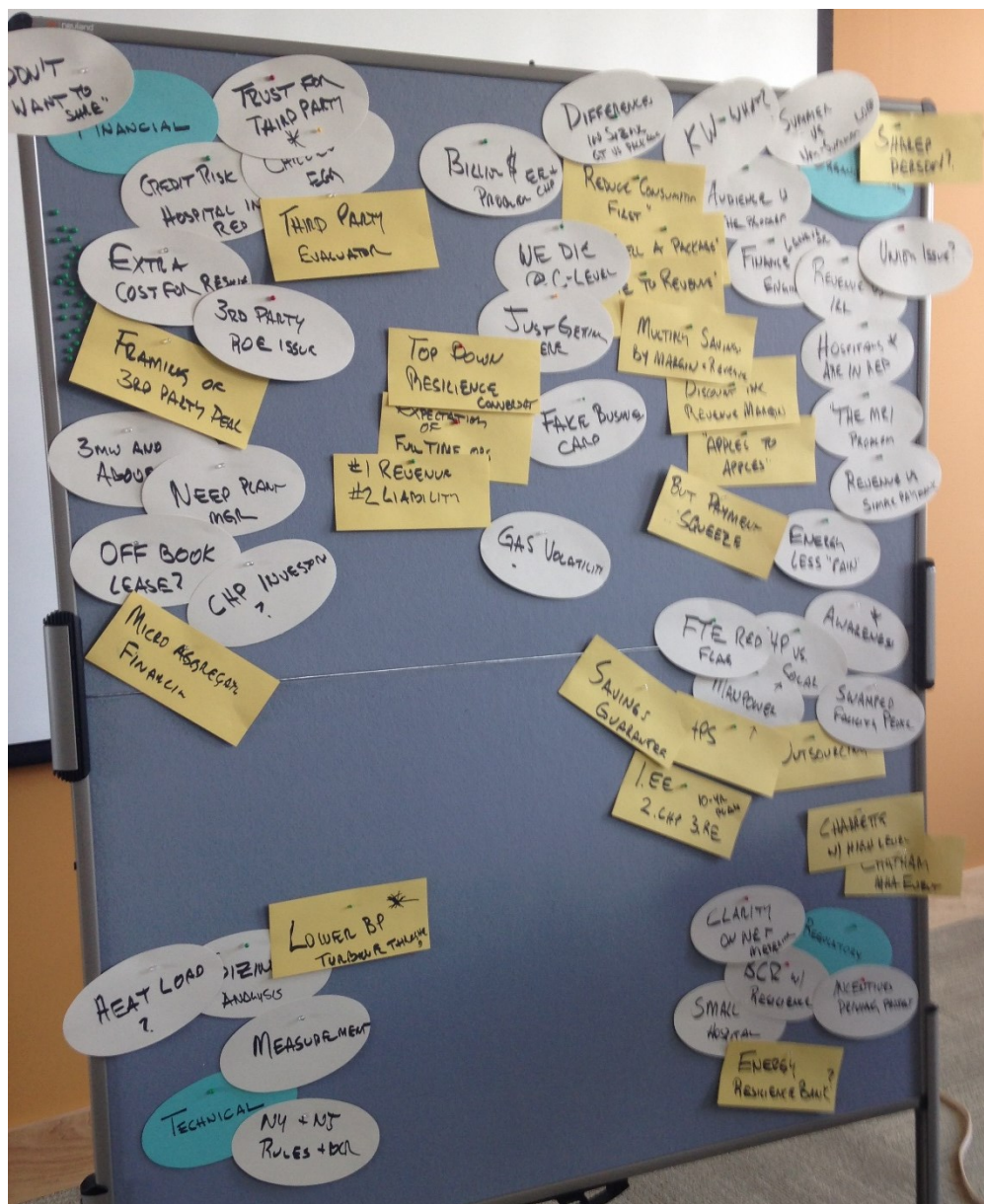
Barriers

- Benefit/Cost ratios do not allow for inclusion of off-grid performance benefits
- Uncertainty around net metering regulations

Solutions

- Massachusetts has made funds available for energy resilience projects that provide backup power during grid outages. These programs were one-time funding opportunities and may not be repeated. With that, exploring more programmatic incentives to support energy resilience projects was suggested as one approach to increasing the number of off-grid capable CHP systems at Massachusetts health care facilities.
- Benefit/Cost models drive how projects can be funded through ratepayer funded utility efficacy programs. Participants noted that both New Jersey and New York used different benefit/cost calculations which allowed for more favorable treatment of CHP systems.
- Other participants noted that incentives and other regulatory issues in Massachusetts were not a major barrier to CHP development.

A photograph of the discussion board from the session after solutions and ideas were grouped together is provided below along with a matrix of topics discussed.



Financial Barriers	Financial Solutions	Organizational Barriers	Organizational Solutions	Technical Barriers	Technical Solutions	Regulatory Barriers	Regulatory Solutions
Disinterest in sharing benefits with third-party owners/High returns for third party owners/Chicken & Egg problem		<p>"We die at the C-Level"/ Audience is the problem / Finance language vs. Engineering language /</p> <p>Awareness of CHP Technology</p>	<p>Speak in "revenue" instead of IRR or Simple Payback / Talk about 1) Revenue then 2) Liability / Multiply savings by margin to translate to required revenue / create apples to apples comparison / Charrette with high-level leaders (Chatham Event)</p>	Small hospitals too small / not enough heat load		Extra cost for resilience / BCR for resilience / incentives driving projects	Energy resilience bank
Credit risk for financially distressed hospitals		Adding an FTE is a Red Flag / increasing manpower / facility people already swamped / Labor issues with new assets to manage	Expectation of need for full time hire not correct / shared manager? / APS revenue covers O&M / outsourcing ops		Lower threshold for BP turbine	Clarity on net metering	
Trust in third party owners	Third party evaluator / Saving guarantees	The MRI Problem					
Third-party project size threshold (3MW and above)	Micro aggregator for finance	CHP competes with solar	Sell CHP as a package with other options / reduce consumption first / create 10-year plan 1. EE, 2. CHP, 3. RE				
Need for a new plant manager			Resilience conversation must be from the top				
Uncertainty about off-book treatment of leases							
Gas price volatility							

Small Group B Notes

Participants: Charlotte Kim (Wilson Sonsini Goodrich & Rosati), Stephan Pritchard (Renew Energy Partners), Leo LaRosa (BMC), Dave Duncan (HealthAlliance Hospitals), Bill Ravanese (HCWH), Matt Foran (National Grid), David Garrison (Tecogen), Carl Lockhart (Cogen Power Technologies), Jim McManus (Slowey McManus), Robert DiGiandomenico (Eversource)

Financial

Barriers

- Competition for capital
- CFOs not interested in third-party ownership
- Use of simple payback instead of net present value
- Gas supply and volatility
- Debt capacity
- Contract risk falls on CFO
- TPO investors not interested in the small-to-mid-sized hospital market

Solutions

- To help mitigate questions of placing the risk burden on the CFO and debt capacity, participants suggested that performance contracting with third party ownership as an appropriate financing option to keep projects off-balance sheet. Consensus was not reached as to if this would work for small-to-medium entities.
- The utilities shared that gas supply could be guaranteed through transportation agreements, but this would not address disruption in the macro-supply.
- Participants suggested that there could be a role for the government to play in helping provide credit enhancements or debt products for small-to-medium facilities where the private-sector is not active following examples such as New Jersey's Resilience Bank, and the Connecticut and New York Green Banks.

Organizational

Barriers

- CFO understanding relative to understanding of facilities managers and other staff
- Management's understanding of issues compared to operational reality
- In Boston, the CFOs meet together monthly, but have limited exposure to external expertise
- Increased use of electronics not tied to importance of increased electrical resiliency
- Few visible successful case studies
- Silo-ed information
- Hospitals are not internalizing the increased number of extreme weather events and disasters

Solutions

- Conduct and make available more in-depth feasibility assessments which include all possible benefit streams including electrical and thermal resilience. They also cited the importance of highlighting successful case studies which have been able to innovatively leverage funding such as the Boston Medical Center's campus loop system.
- One participant shared that he has been able to get traction with hospitals that have switched to electronic medical records, since electrical resilience is then directly tied to patient welfare, which is core to the hospital's business.
- Declining revenues and consolidation within the hospital industry has been compounded by a number of factors including the Affordable Care Act. In the case of declining revenues, investments which can reduce costs, and thus lower the revenue requirement of the hospital, such as CHP become more important.

Technical

Barriers

- Host facility infrastructure limitations
- Perception of technical issues/reputation from reports of existing CHP systems being shut down
- Greater market awareness in other markets compared to MA (i.e. CT, NY)
- Boston-area interconnection issues and spot networks
- Lack of CHP engineering expertise in Massachusetts

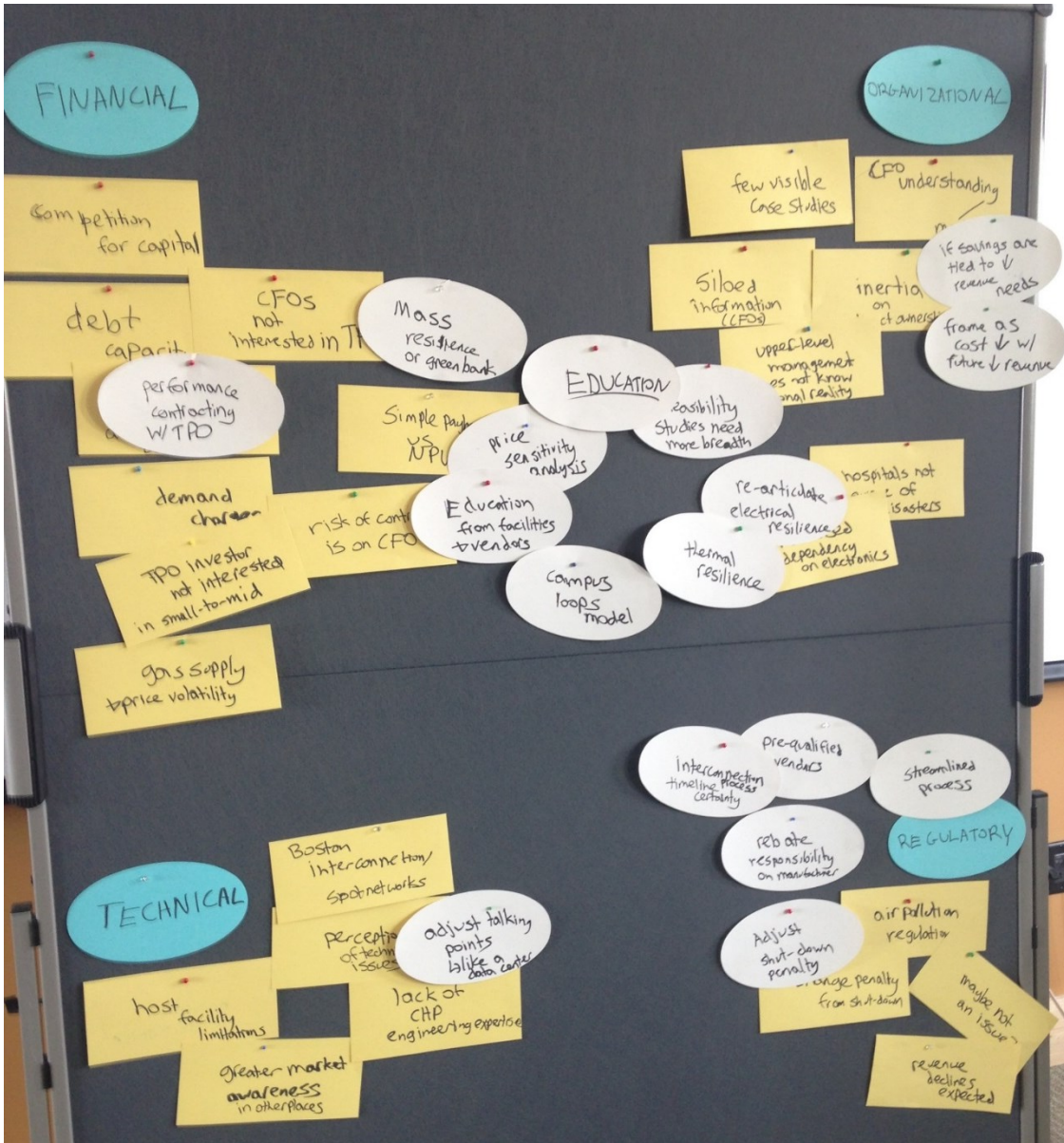
Solutions

- The discussion focused primarily on overcoming the perception of technical constraints to CHP. Participants believed this could be solved through education and discussions with facilities managers.
- Participants also suggested that an approved vendor list to qualify for incentives would help increase installation and system quality, akin to the list NYSERDA has for New York State.

Regulatory

- Violations of air pollution regulation trigger system shut down
 - Makes selling CHP more difficult while hospital revenues are continuing to decline and systems are not producing expected benefit
- Interconnection process is not coordinated with sales cycle and is designed primarily for PV
 - Complex process for applying for incentives
- Participants discussed adjustments to air pollution regulations which would:
 - Be based on staying below an average emissions threshold over a given time period, as opposed current regulation, which require real time monitoring and shutdown at the first violation of a threshold.
 - Allow a limited grace period during which owners, operators and/or manufacturers could keep running and then repair/upgrade CHP systems to address any issues, as opposed to current law, which immediately forces systems to be shut down.
- It was also shared that the process for applying for utility incentives is quite burdensome for hospitals, and could benefit from streamlining. This revised process could also be coordinated with a more CHP-friendly interconnection process, which would provide developers with a timeline estimate for a system to be connected to the grid.

A photograph of the discussion board from the session after solutions and ideas were grouped together is provided below.



Financial Barriers	Financial Solutions	Organizational Barriers	Organizational Solutions	Technical Barriers	Technical Solutions	Regulatory Barriers	Regulatory Solutions
Competition for capital	Performance contracting with TPO	Few visible case studies	Longwood medical center model and others	Boston interconnection/spot networks	Adapt interconnection processes for CHP cycles – currently optimized for solar	Air pollution regulation penalty is system shut-down	Revise regulations to issue warning with time for systems to comply
Debt capacity		Siloed information		Host facility limitations		Complex process for applying for incentives	Streamline process
CFOs not interested in TPO		CFO vs. facilities engineer understanding of systems	CHP investments reduce costs which lower revenue requirements- CFO's may be sensitive to this framing	Greater market awareness in other regions (i.e. NY)	Further education and case studies		Adjust interconnection timeline to follow CHP sales cycle
Investors for TPO models not interested in small-to-mid-sized hospitals	Mass resilience bank or green bank	Increased use of electronic systems not linked with electrical resilience	Re-articulate importance of electrical resilience and back-up generation for patient welfare	Lack of CHP technical expertise in MA	Develop approved vendor list akin to ConEdision		Place rebate responsibility on manufacturer
Gas supply and price volatility	Utility transportation agreements for local-level supply issues	No internalization of increased natural disasters		Perception of technical issues	Highlight successful case studies		
Contract risk falls on CFO		Inertia		Contract risk falls on CFO			
Demand charges		Upper-level management unaware of operational realities	More in-depth feasibility assessments and incorporation of thermal resilience	Demand charges			
Use of simple payback vs. use of NPV	Introduce price sensitivity analysis, education from facilitators and vendors			Use of simple payback vs. use of NPV	Introduce price sensitivity analysis, education from facilitators and vendors		

Small Group C Notes

Participants: Mark Klein (Nexant), Vic Radina (Morgan Stanley), Aaron Walters (Green City Power), Galen Nelson (MassCEC), Mike Grimmer (Heywood Hospital), Beka Kosanovic (UMass Amherst), Dinesh Patel (National Grid), Rob McMention (Co-Energy America)

Financial

Barriers

- CHP faces intense competition for capital in hospitals with limited resources
- IRR expectations for CHP are higher than other investments (because CHP is non-core)
- CHP often requires complex financing and structuring
- Unclear whether aggregating CHP financing/installation across hospitals (to drive down cost and reduce risk) is possible

Solutions

- Because CHP is non-core, it faces intense competition with other investments in hospitals. This means that a higher IRR is often required for hospital executives to invest in CHP when compared with other strategically core investments. Thus, further improving the economics and or sales pitch for CHP is necessary.
- Complex financial structuring for CHP can be overcome by developing a CHP concierge/owner's agent service to assist executives evaluate opportunities. A number of models/case studies were proposed, ranging from DCAMM, utility advisory support, or UMass Amherst CHP technical assistance.
- Aggregation of CHP installations across hospitals was proposed as a solution. A robust debate emerged regarding whether this would work. Stakeholders generally agreed that it could work, providing the following benefits (i) some hardware savings, depending upon the number and type of equipment installed, (ii) significant engineering and installation savings due to economies of scale associated with bidding out multiple projects to one firm, and (iii) significant potential for a reduction in financing costs, if the aggregate projects were of large enough scale to access institutional capital (i.e. at least \$50 million investment)

Organizational

Barriers

- Poor education and outreach to executives (CEOs)
- CHP is a "non-core" strategic priority for hospitals
- CHP is not sexy to CEOs
- CHP developers lack credibility
- Hospitals often lack CHP champion
- Hospitals lack bandwidth to consider CHP

Solutions

- Internal champions at hospitals must be identified, who are credible and are able to frame the CHP message in terms that resonate with executives (compelling financial results, positive marketing, etc.). It was generally agreed that only champions with significant credibility with the CEO/CFO could be effective. In the Pacific Northwest, the utilities hired the recently retired President of the Washington State Hospital Association to help improve utility offerings and sales collateral, open doors, make the case to his peers, etc. <http://neea.org/resource-center/neea-white-papers>
- In particular, operations managers must translate CHP performance and efficiency into a compelling financial metrics that address both long- and near-term needs that hospital executives face (e.g. quarterly performance as well as lifecycle costs)

- Investment in CHP by executives should be framed as a positive media story (in many cases, CHP investment is considered risky to the reputation of the CEO). It is essential to drive positive publicity and media stories related to CHP to increase the prestige of executives who have invested in these renewable energy systems.
- Development of a review guide, certifications, or technical assistance service to increase credibility of CHP in the eyes of decision makers. This could include, for example, enabling hospitals to work with an owners' agent to get the right conceptual/engineering model in place and then bidding out the project based on clear project specs.

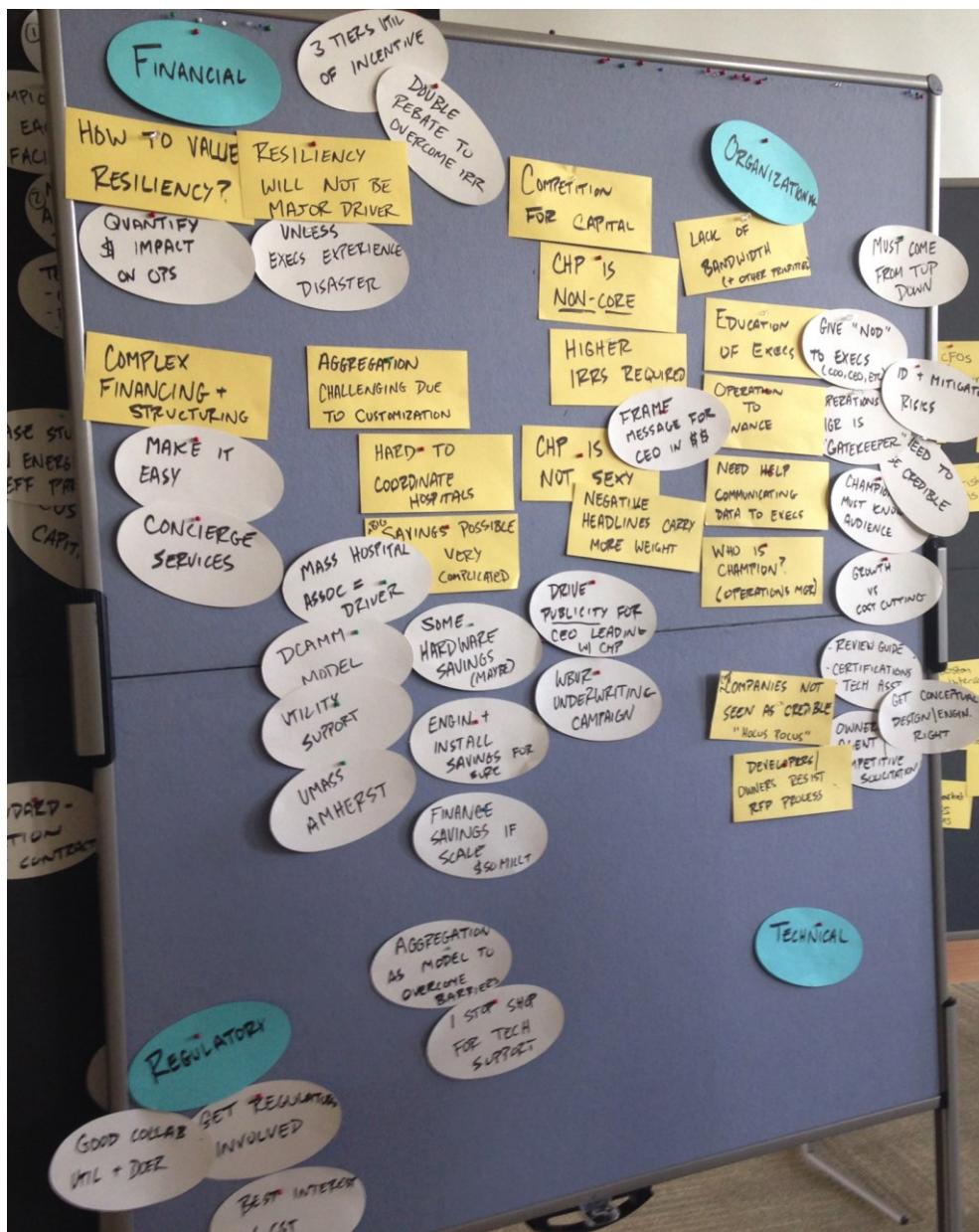
Technical

Technical issues were not discussed by this group.

Regulatory

Regulatory issues were only briefly mentioned during discussion. Stakeholders noted that regulators ought to be actively involved to support investment/installation in CHP systems. Some stakeholders suggested that the utilities and Mass DOER already communicate closely re: CHP development in the Commonwealth.

A photograph of the discussion board from the session after solutions and ideas were grouped together is provided below.



Financial Barriers	Financial Solutions	Organizational Barriers	Organizational Solutions	Technical Barriers	Technical Solutions	Regulatory Barriers	Regulatory Solutions		
How to value resiliency?	Quantify \$ impact on ops	Competition for capital /	Frame message for CEO in \$\$ / Growth vs. cost cutting / ID and mitigate risks	Not discussed	Not discussed	Not discussed	Get regulators involved		
		Higher IRRs required						Good collaboration between utilities + DOER	
Resilience will not be major driver	...unless execs experience disaster	CHP is non-core to hospitals							
Complex financing structuring	Make it easy / concierge services	CHP is not sexy							
Aggregation challenging due to customization / hard to coordinate hospitals/ big savings possible, but very complicated	MHA as driver / DCAMM model / utility support / UMass Amherst support / some hardware savings/ eng+install savings for sure / finance savings if scale to \$50 MM	Negative headlines carry more weight	Drive publicity for CEOs that are leading / WBUR underwriting campaign						
	Aggregation model for overcoming barriers	Who is the champion? / Lack of bandwidth and other priorities	Champion must know audience / ops manager is gatekeeper / needs to be credible						
	One-stop shop for tech support	Education of Execs / need help communicating data to execs	Decisions must come from the top						
		Companies not seen as credible "Hocus Pocus" / Developers/owners resist RFP process	Review guide/ certification / tech assistance / get conceptual design/engineering right / owners agent & competitive solicitation						

Appendix II: Invited Attendees

National Grid

1. Matt Foran National Grid
Commercial Sales Leader, MA-South
2. Dinesh Patel National Grid
Principal Engineer/Tech. Policy
3. Jose Veiga National Grid
Senior Sales Rep.
4. John Rathbun National Grid
Lead Technical Support

Eversource

5. Jim Ruberti
CHP Program Manager
6. Robert Di Giandomenico
Project Manager

Mass Department of Energy Resources

7. John Ballam
Mngr Engineering & CHP Program

PACE University Energy & Climate Center, NYC

8. Tom Bourgeois, Deputy Director

University Mass Application Center, Amherst,MA

9. Beka Kosanovic, Director, Center for Energy Efficiency

Mass Clean Energy Center

10. Galen Nelson, Director of Market Development

Wilson Sonsini Goodrich & Rosati, NY

11. Charlotte Kim, Partner

Renew Energy Partners, Boston, MA

12. Stephen Pritchard, Principal

Morgan Stanley, Finance Group Philadelphia, PA

13. Vic Radina, Finance Advisor/Energy Field

MHR Development Hartford, CT

14. Mark Robbins, Principal

Green City Power, Chicago, IL

15. Aaron Walters Co-Founder

Heywood Hospital Gardner, MA

16. Mike Grimmer, COO,

Partners Healthcare Boston MA

17. CHAI Tsirisirikul , Director of Engineering

Boston Medical Center, Boston, MA

18. Leo LaRosa , Director Infra-Structure & Utilities Planning

Cogen Power Tech, Latham, NY

19. John Moynihan, Managing Director

Co-Energy America, Upton, MA

20. Rob McMenimon Principal

Ameresco

21. Rob Morin, Waltham, MA
Director

Tecogen

22. David Garrison, Waltham, MA
Chief Financial Officer

Nexant

23. Mark Klein, Boston, MA
Director, Commercial & Engineering

HCWH Group

24. Bill Ravanesi
Senior Director of Health Care Green Building & Energy Program
25. Paul Lipke
Senior Advisor Energy & Buildings
26. Gary Cohen
Founder & President
27. Stephanie Buckler Outreach Specialist

Mass Hospital Association, Burlington,MA

28. Anuj Goel, VP Legal & Regulatory Affairs

HealthAlliance Hospitals, Leominster,MA

29. Dave Duncan, Corporate VP, Facilities & Engineering

Meister Consultants Group, Boston, MA

31. Andy Belden
32. Kathryn Wright
33. Neil Veilleux

Slowey McManus Communications, Boston, MA

34. Jim McManus, Partner
35. Carrie Nash, Communications

Appendix III: Survey Results



MASSACHUSETTS HOSPITAL
ASSOCIATION
MEMBER CHP SURVEY



MHA MEMBER CHP SURVEY OVERVIEW

- Survey of Massachusetts Hospital Association members:
 - Hospital energy conservation investment
 - Decision-making processes
 - CHP knowledge and barriers
- 27 full responses
 - Both C-suite and operations staff
 - Mix of large and small health care facilities



A FEW KEY TAKEAWAYS

- Most respondents very familiar with CHP technologies
- Energy management not typically a full-time job at facilities surveyed
- Majority evaluate energy savings investments in same manner as other capital investments
- Simple payback used by most facilities to evaluate investments
- Third-party ownership models familiar to most respondents
- Insufficient benefits and internal competition for capital most frequently cited reason for not moving forward with CHP project
- Environmental benefits generally ranked below other drivers of energy efficiency investments
- Aggregate purchasing models potentially of interest to most respondents
- Operations during power outages is critical factor in decision making



MAJOR CHP BARRIERS FROM SURVEY

- Insufficient benefits compared to other investment opportunities
- Lack of incentives for systems with off-grid operations
- Uncertainty about system savings



BARRIERS IDENTIFIED IN OTHER FORUMS

- Challenges posed by natural gas availability and volatility in fuel prices
- Integration into network grids
- Interconnection timeline
- Reluctance to share savings with third-party owners

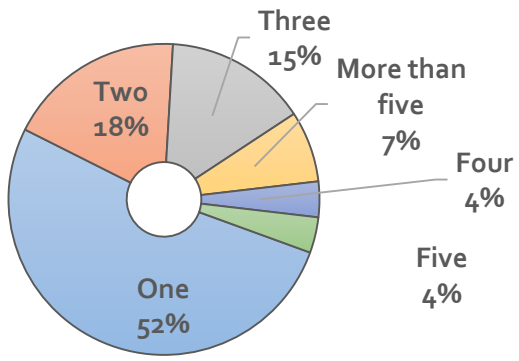


Survey Results

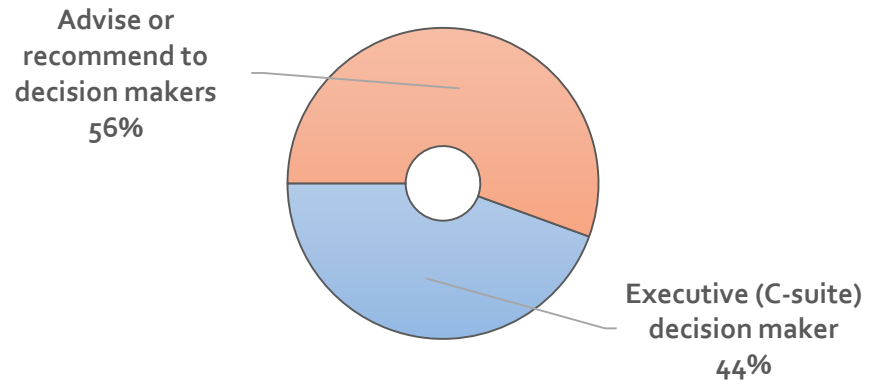
RESPONDENT PROFILE:

27 HEALTH CARE FACILITY LEADERS AND MANAGERS

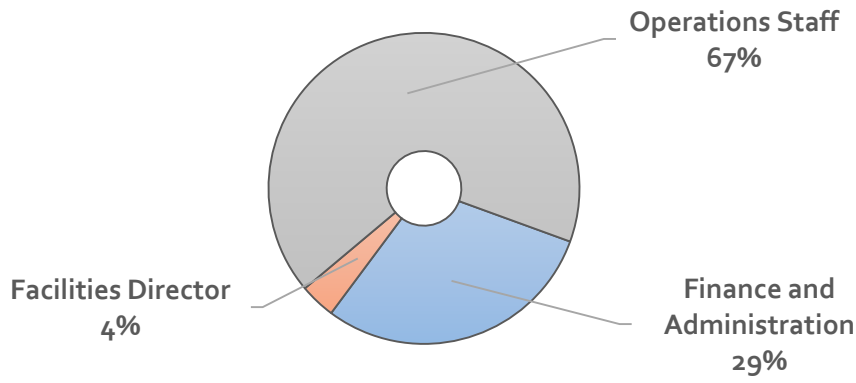
How many healthcare facilities do you work with and/or have oversight of?



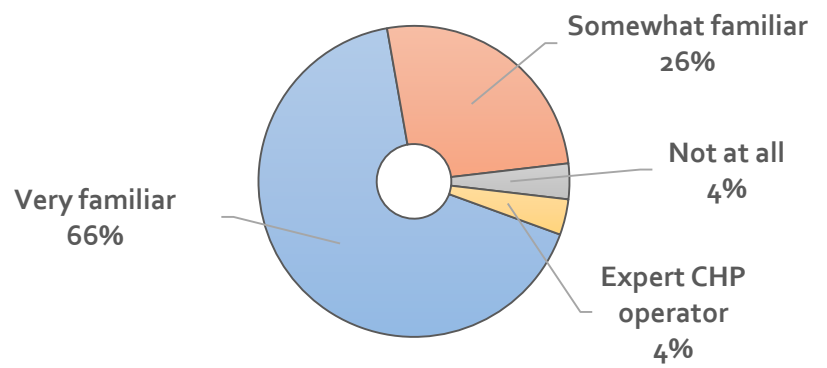
How would you describe your decision-making authority?



What role best describes your responsibilities at the hospital?



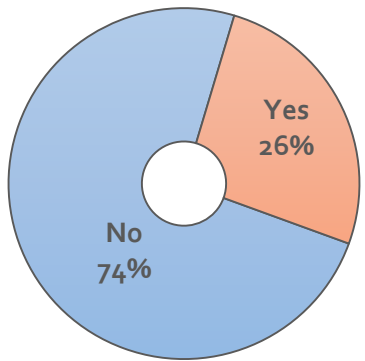
How familiar are you with Combined Heat and Power technologies?



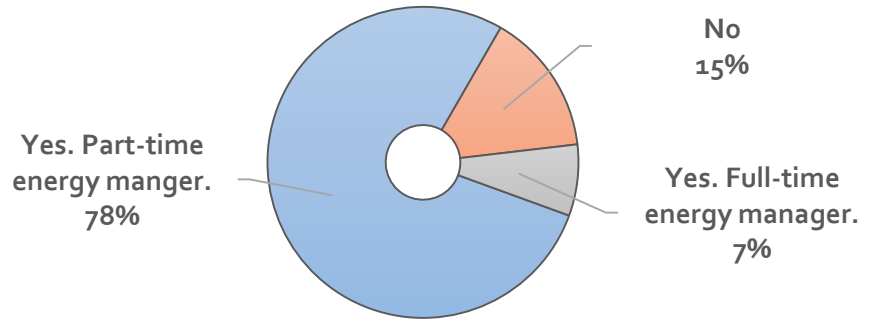


RESPONDENT PROFILE: ENERGY DECISION MAKING PRACTICES

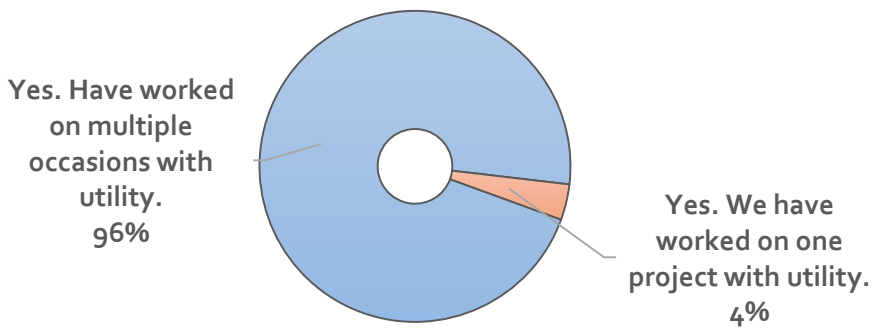
Do you have CHP?



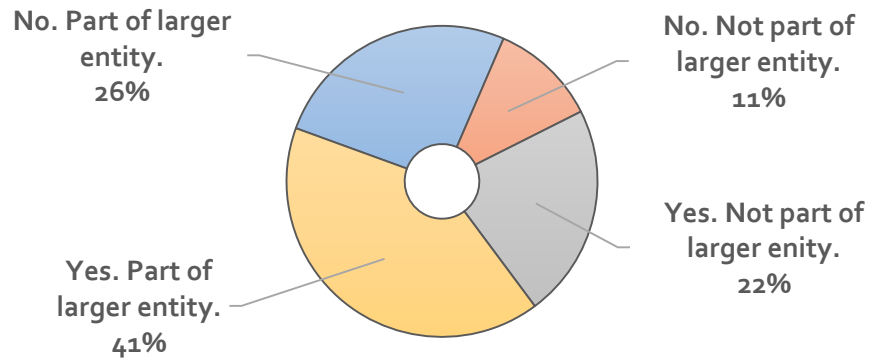
Does your hospital have staff responsible for evaluating and pursuing energy savings?



Has your facility worked with the local utility on energy efficieny projects in the past?

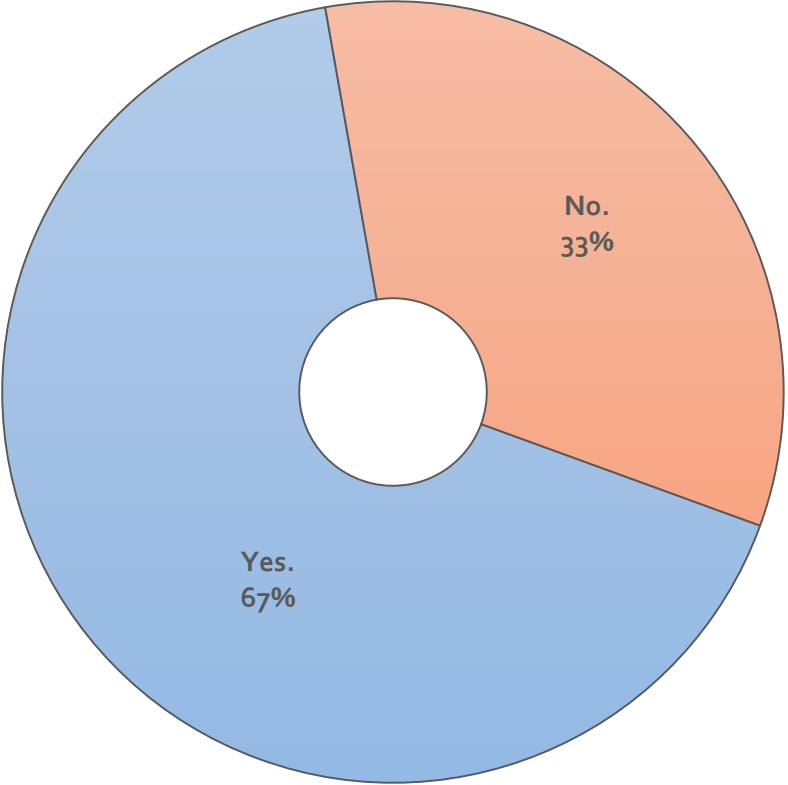


Does your faciltiy/facilities have energy and greenhouse gas goals?



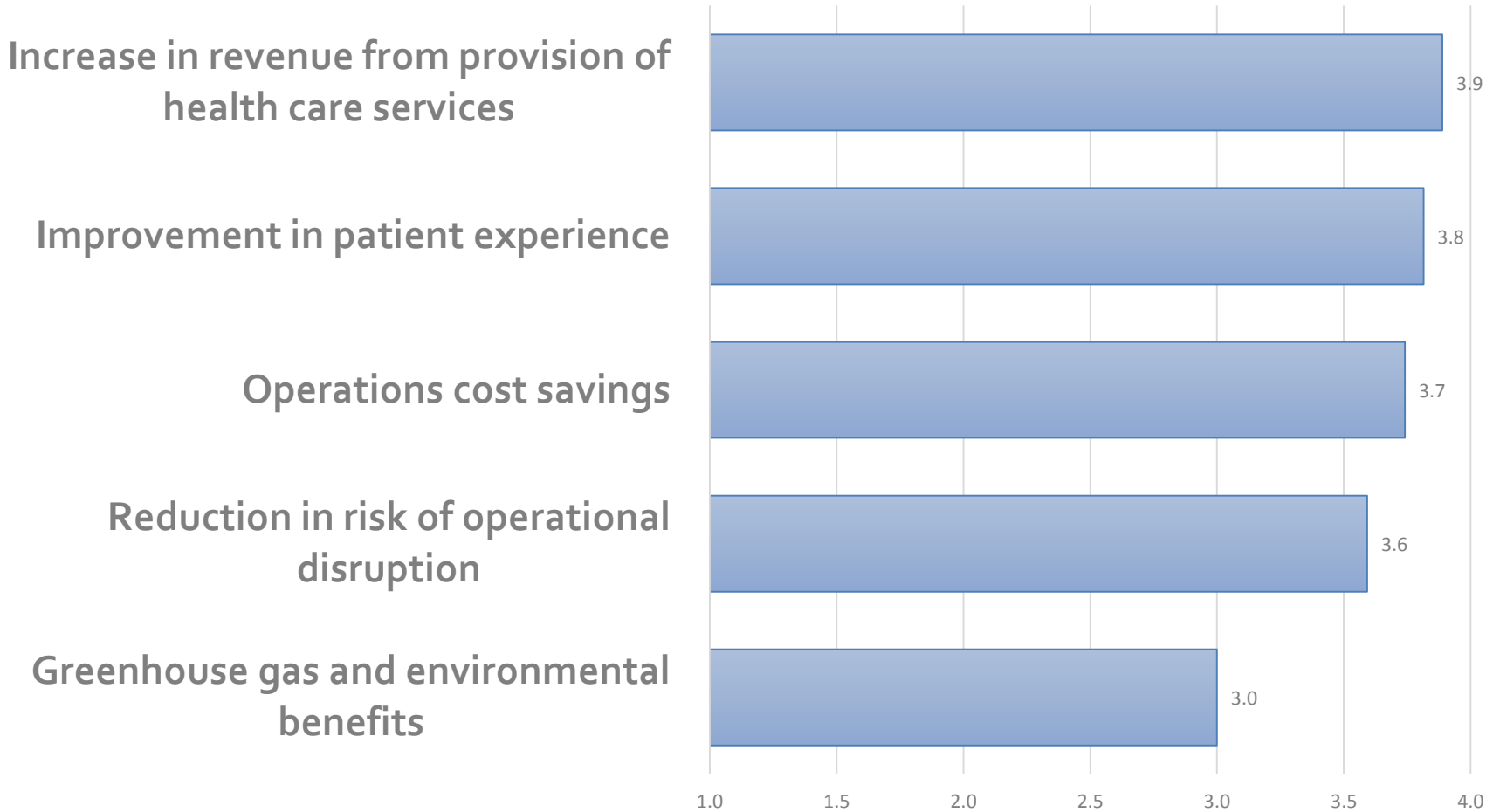


Are energy savings investments evaluated using the same metrics as other capital investments?



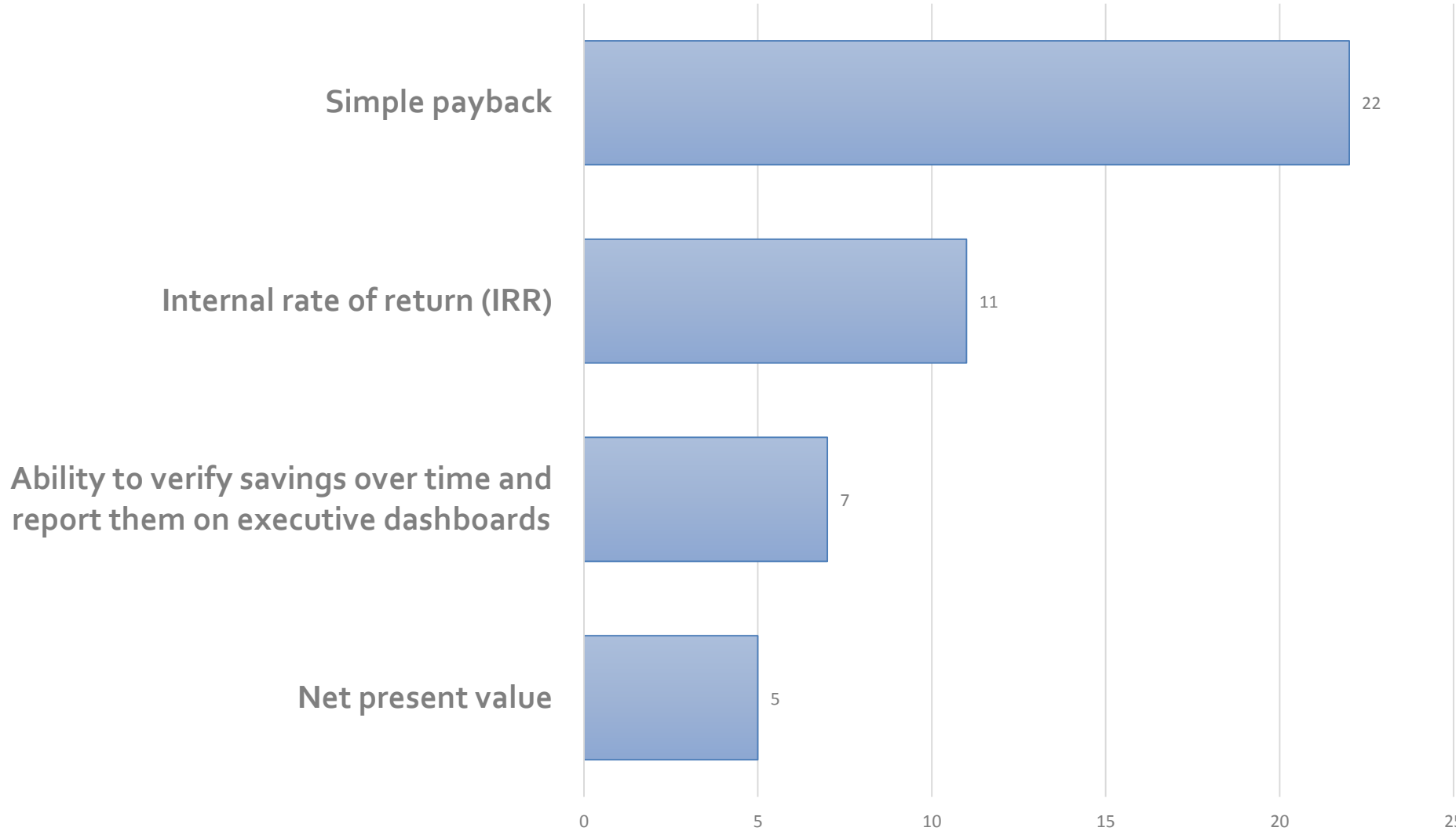


In prioritizing capital investments, our facility (or facilities) would typically prioritize the following criteria. (4= MOST IMPORTANT; 1= LEAST IMPORTANT)



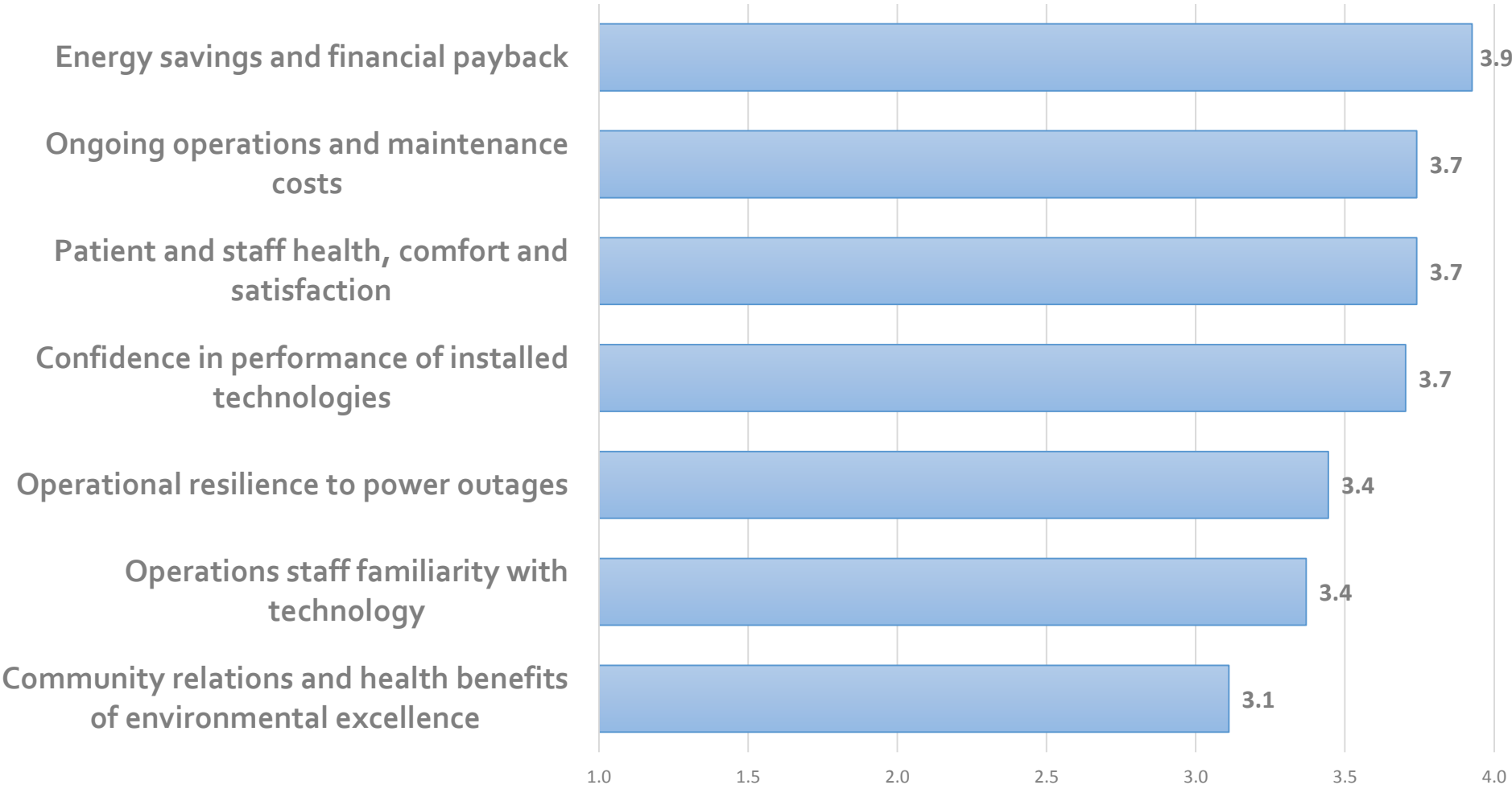


On what basis does your facility typically evaluate energy savings investments? (Select all that apply)



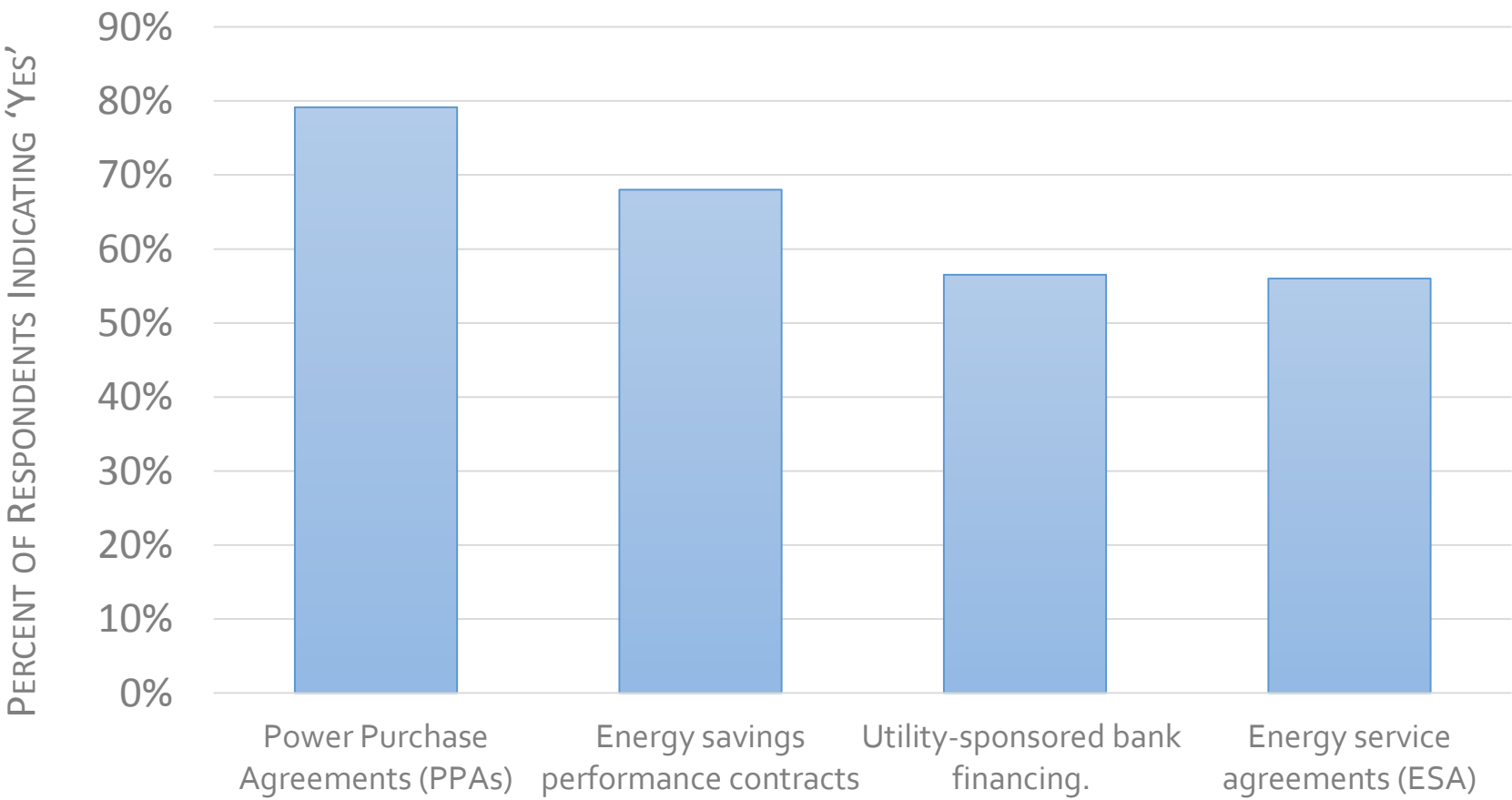


WHEN EVALUATING ENERGY SAVINGS INVESTMENTS HOW IMPORTANT ARE THE FOLLOWING FACTORS IN YOUR DECISION-MAKING? (4= MOST IMPORTANT; 1= LEAST IMPORTANT)



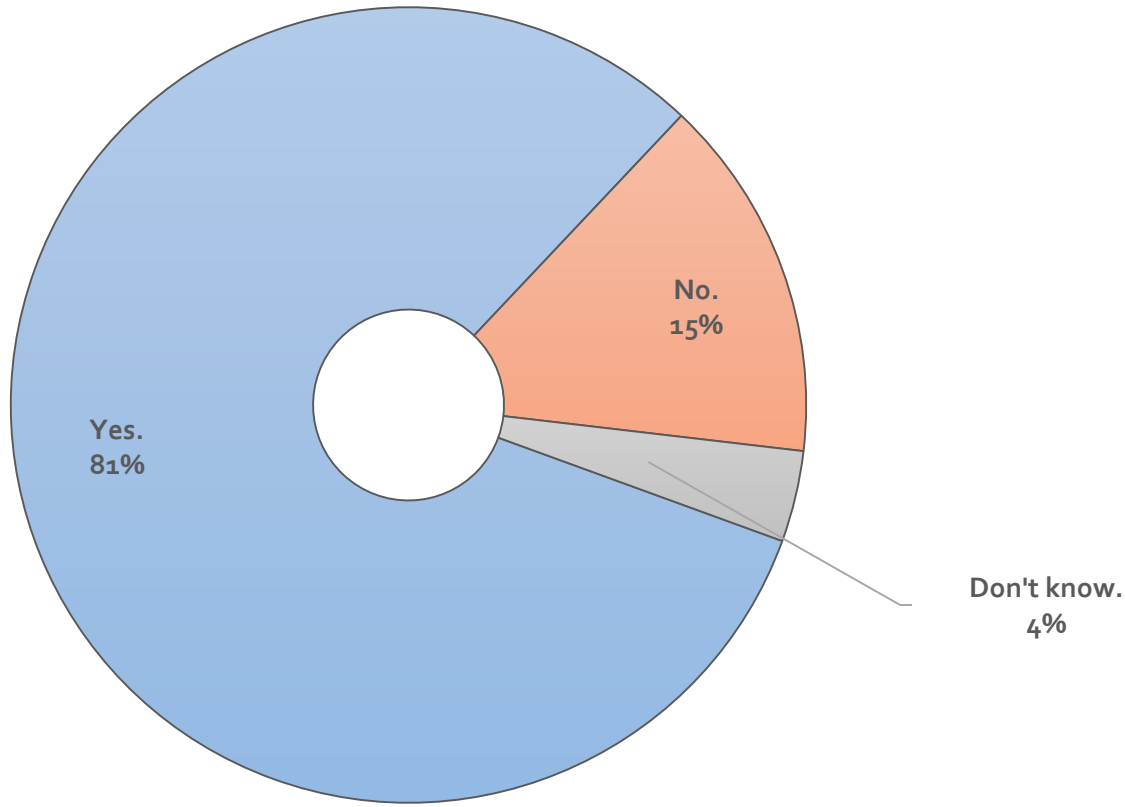


HAVE YOU EVALUATED ANY OF THE FOLLOWING ALTERNATIVE OPTIONS FOR FINANCING ENERGY EFFICIENCY INVESTMENTS?



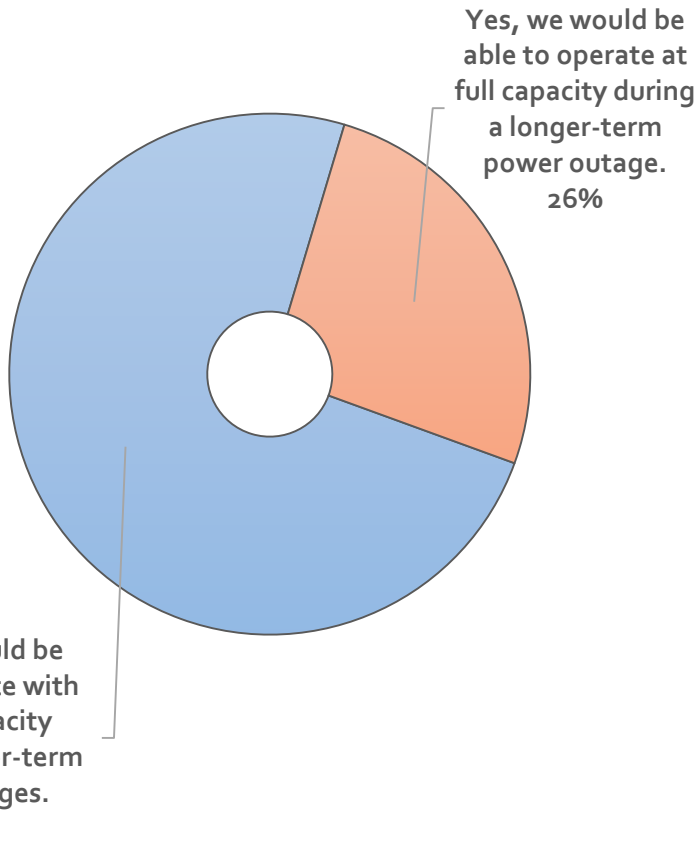


Do decision making processes include evaluating the risks and costs of long-term power outage to health and safety of patients and staff?

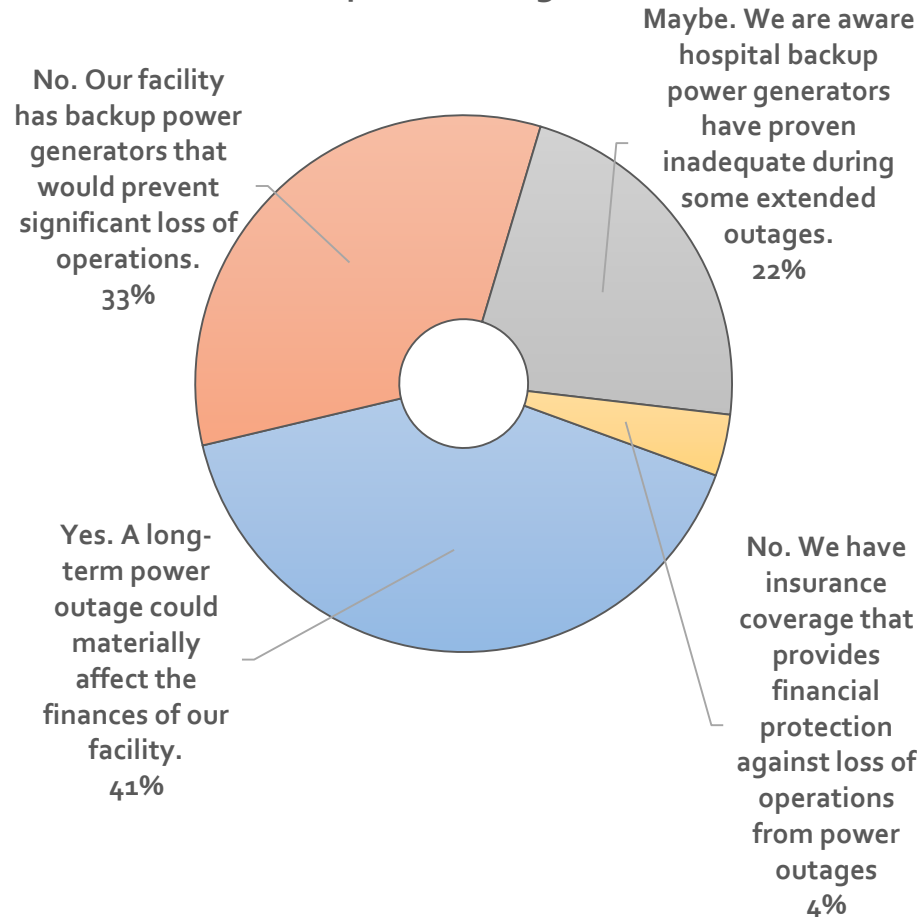


OPERATIONAL RESILIENCE

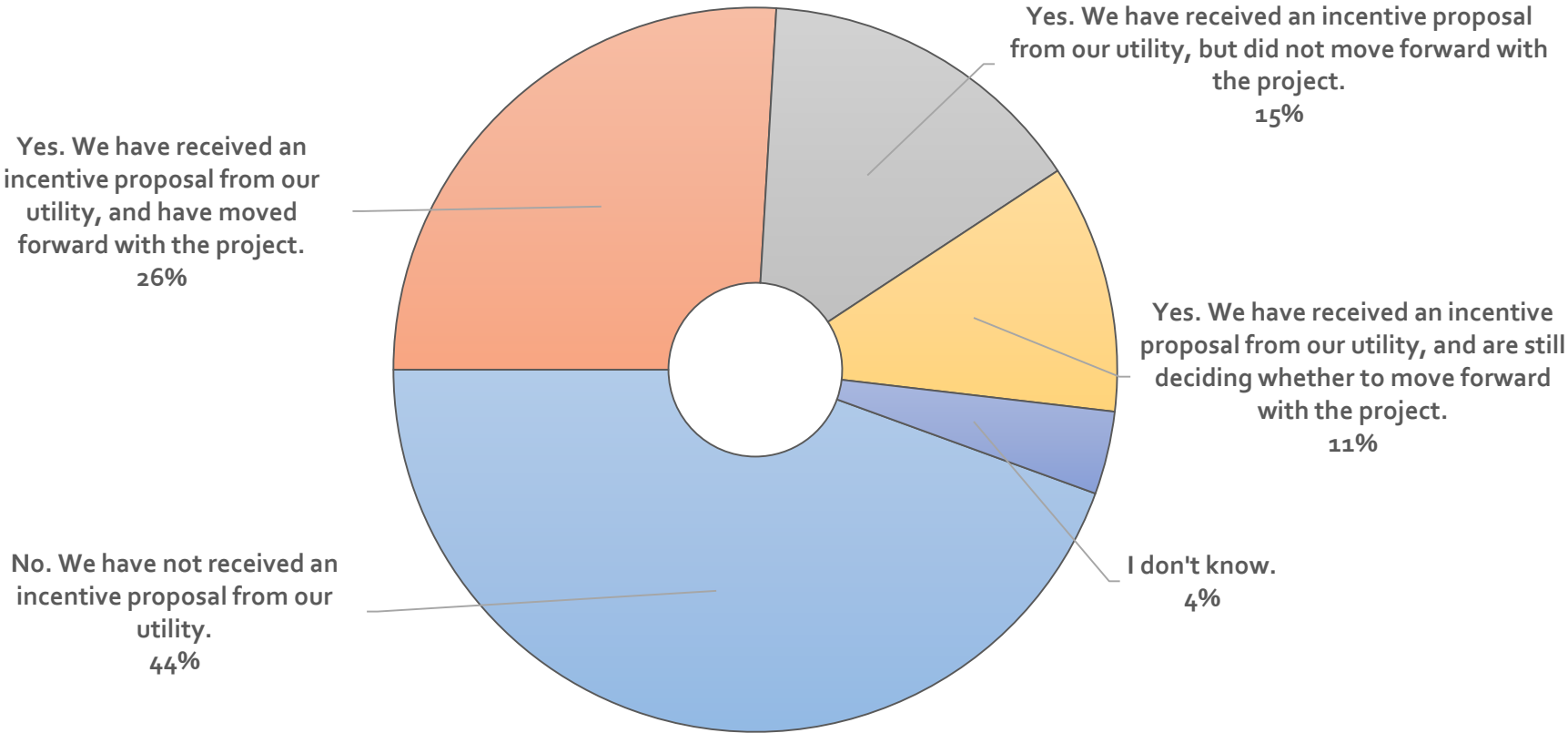
In the event of power outage greater than 96 hours, would your facility be able to operate?




Is your facility likely to incur significant financial losses in the event of a long-term power outage?

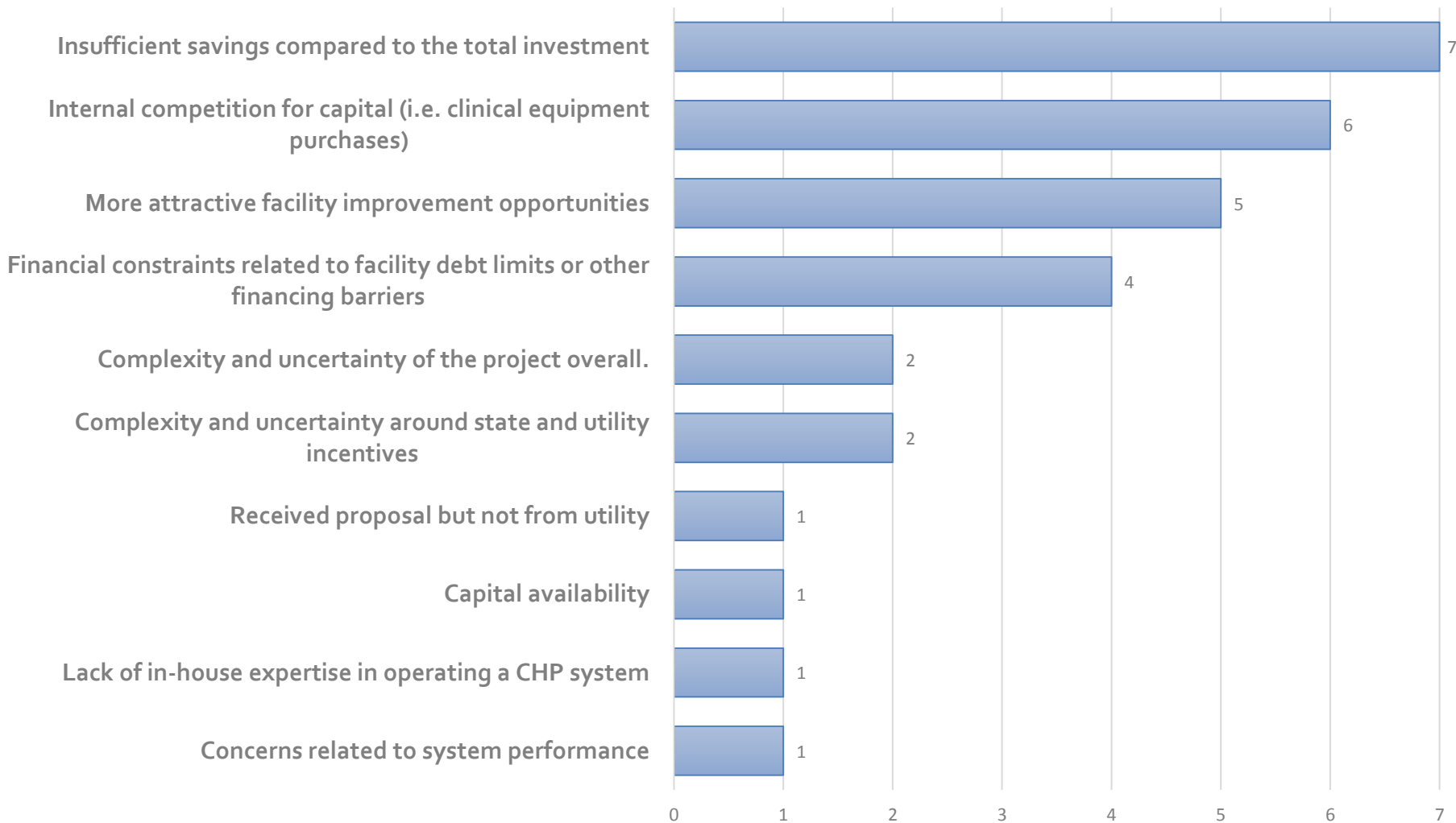



HAS YOUR ELECTRIC OR GAS UTILITY PROVIDED YOU WITH AN INCENTIVE PROPOSAL FOR A COMBINED HEAT AND POWER SYSTEM AT YOUR FACILITY?



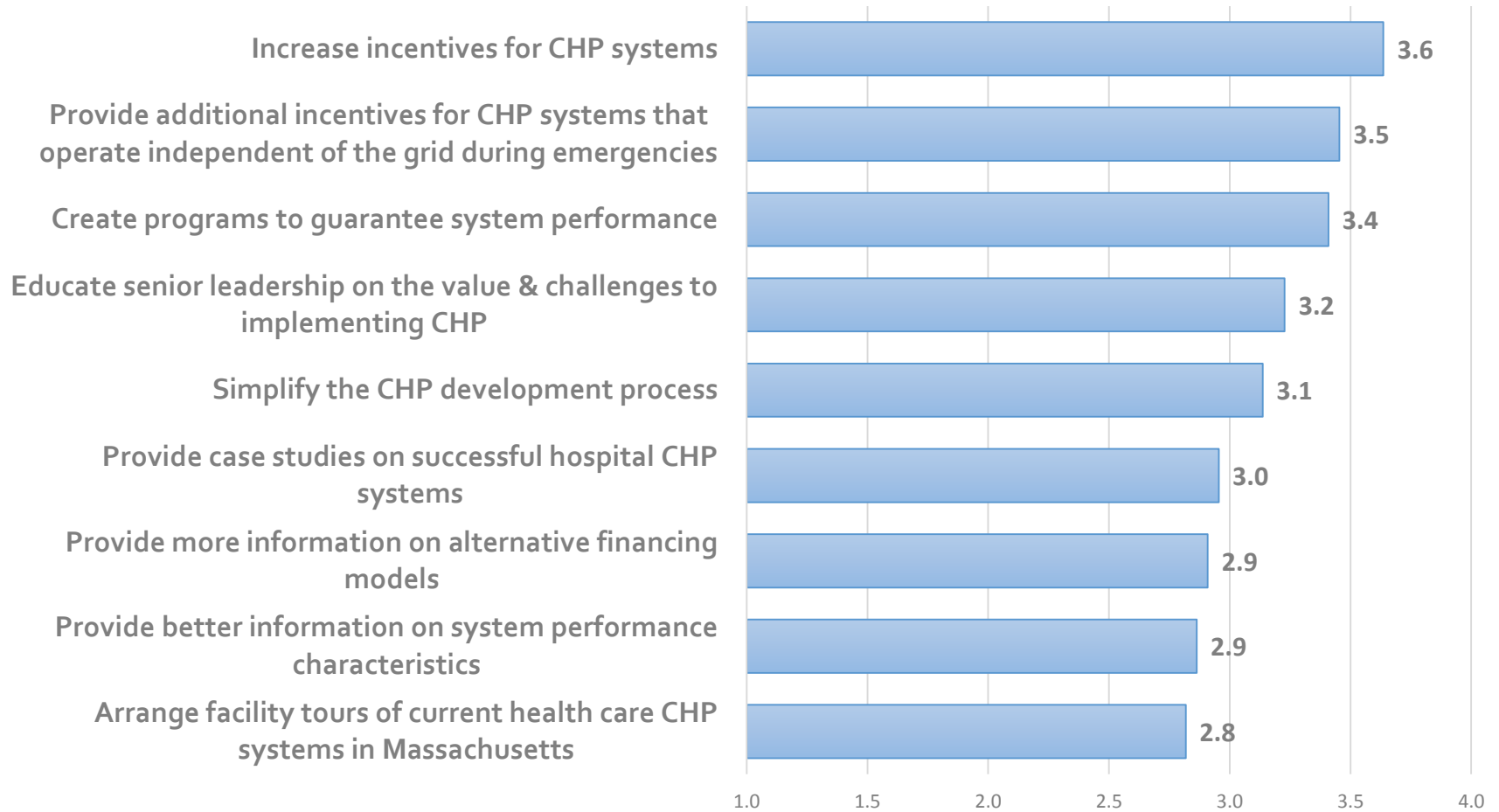



IF YOU HAVE RECEIVED A UTILITY INCENTIVE OFFER FOR A COMBINED HEAT AND POWER SYSTEM, BUT DID NOT MOVE FORWARD WITH THE PROJECT, WHAT PREVENTED YOUR FOR IMPLEMENTING THE PROJECT?





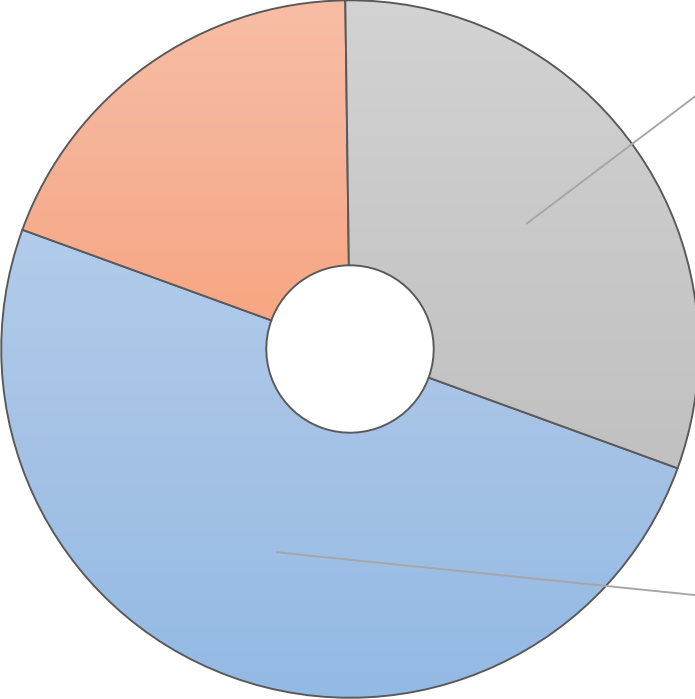
WHAT ADDITIONAL ACTIVITIES OR INFORMATION COULD INCREASE THE LIKELIHOOD THAT CHP WOULD BE ADOPTED AT YOUR FACILITY IN THE FUTURE?
(MOST USEFUL = 4; NOT USEFUL = 1)





MIGHT YOUR INSTITUTION BE WILLING TO INVEST TIME IN WORKING WITH OTHER MASSACHUSETTS HEALTH CARE FACILITIES TO EXPLORE AGGREGATE CHP PURCHASING TO LOWER THE COST?

No. That is not likely to be of sufficient interest.
19%



Yes. That could well be of interest.
31%

Maybe. That might be of interest.
50%

CHP Thought Leaders Roundtable

Westborough MA
April 29, 2015

Thomas Bourgeois
Deputy Director
Pace Energy and Climate Center

Setting the Stage

CHP appropriately designed and operated can be an outstanding investment for MA Hospitals

*CHP technical & economic potential in hospitals falls **far short** of the installed base.*

How do we most effectively influence the rate of new project development ?

CHP in Hospitals

- ✓ Tested
- ✓ Proven
- ✓ Economic
- ✓ Reliable
- ✓ Clean

Market Environment is Favorable

MA has strong state incentives

Energy savings are one area where hospitals can affect margins, offsetting revenue erosion

CHP enables critical infrastructure resiliency

Innovation in financial instruments and capital looking for higher return, manageable risk

Top 4 States for New CHP Installations 2007 - 2013

STATE	# of CHP Installations
CA	274
NY	184
CT	106
MA	87

Northeast is Epicenter of Activity for Community MicroGrids

Governor Cuomo Announces NY Prize Resiliency Competition to Launch This Fall (August 28, 2014)

Patrick Administration Awards \$18.4M to Communities for Energy Resiliency Projects (December 29, 2014); \$7.4 Mil. Announced 9/25/2014

Governor Malloy: Microgrid Projects In Bridgeport and Milford Awarded \$5 Million in State Funding to Harden Energy System (October 8, 2014)

Nine microgrid projects awarded a total of \$18 million in funding through the CT DEEP Microgrid Pilot Program (July 24, 2013)

NJ Launches \$200M Energy Resilience Bank for Microgrids and Distributed Generation: Islanding critical facilities will be a priority

State Resiliency Initiatives

- Massachusetts DOER “Community Clean Energy Resiliency Initiative” funded by \$40 million through Alternative Compliance Payments (“ACP”)
- Connecticut P.A. 12-148 Sec.7 established a microgrid grant and loan pilot program. CT P.A. 13-298 authorized an additional \$30 million in funding for the Microgrid Program
- NJ Resiliency Bank established \$200 Million in funding (e.g. WWTPs, Hospitals)
- NY Microgrid Prize (\$40 Mil. 5/2015 – 12/2017)

Why Aren't Meritorious CHP Projects Getting Done?

- * How do we get CHP on the "A" List of Capital investments?*
- * How do we reach the "C" Suite, and what is the message that will be successful?*
- * Addressing financing issues (CHP not central to the mission, CHP crowding out core investments, balance sheet impacts)*
- * Finding internal champions, arming them with the business case for investment*



**It's the "Pain Adjusted"
energy savings that matter!**

Specifying & Procuring,
Financing & Installing,
Operating & Maintaining this Technology
can NOT be materially more challenging
than

the status quo alternative.

Checklist for Identifying High Value Sites

- Concurrent electric and thermal loads for a large proportion of the hours of the year
- Existing central heating and cooling distribution system
- Complementary electric and/or thermal demand at sites within close proximity, enabling a cost-effective integration of building loads.
- Capital equipment at or near end of useful life, warranting replacement in near term
- Expansion plans requiring upgrade to building energy demand
- Located in an area requiring electric utility distribution capital expenditure to meet local reliability needs

Getting the Deal Done

- * Identify & connect with the ultimate decisionmaker
(target the venues they attend)
- * Work with the internal champion and craft the appropriate message
- * Make the deal as streamlined as possible, and
- * Deliver financing that works for the customer

Thank you!

Thomas Bourgeois

Deputy Director

tbourgeois@law.pace.edu

914.422.4013

Pace Energy and Climate Center

<http://energy.pace.edu>