**Changing Industrial Energy Behavior Via Education: Case Study of an Energy Efficiency Refrigeration Certification**

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# ABSTRACT

Complementing the many energy efficiency programs that focus on improving equipment efficiency, education is a key behavioral-based approach that can affect energy consumption in two ways: by changing how customers operate and maintain equipment, and encouraging customers to invest in high efficiency equipment. This paper presents the early outcomes of one such behavioral approach. A program administrator, in collaboration with other stakeholders, has developed and is promoting the Certified Refrigeration Energy Specialist (CRES) designation. CRES aims to encourage refrigeration professionals to master practical, no-cost or low-cost behavioral solutions for optimizing equipment operation for efficiency.

Based on results of research conducted to-date, this paper presents analysis of the theory behind the benefits of certification, how the certification will generate persistent savings, the appeal of the certification program, and the program's successes and challenges. On-site visits are underway with CRES-certified individuals to collect data to estimate energy savings resulting from refrigeration operation by these individuals. Market surveys have been completed with CRES certificants and non-certificants – both managers and operators – which revealed that the awareness and appeal of CRES is high, while adoption of the newly established CRES is low. Executives, in particular, need more convincing of the value of CRES, while non-managing refrigeration professionals will need employer-provided support to pursue CRES. Employers (executives and middle managers) are reluctant to support elements of CRES that require refrigeration professionals to be away from their jobs during work time. This feedback illuminates potential CRES adoption barriers and suggests a need to develop effective "value proposition" messages and/or support for CRES.

# Introduction

A program administrator, together with the Refrigerating Engineers & Technicians Association (RETA), developed a new energy efficiency certification – the Certified Refrigeration Energy Specialist (CRES) credential – for individuals involved with the operation of industrial refrigeration plants, including refrigeration and other plant systems that use energy. The aim was to encourage industrial refrigeration professionals in the Northwest to become CRES certified and apply low- and no-cost energy efficiency practices in refrigeration plant operation.

RETA, a national organization dedicated to the professional development of industrial refrigeration professionals, oversees certification of refrigeration operators in the safe operation of

refrigeration systems. Currently, RETA offers three certifications: Certified Assistant Refrigeration Operator (CARO), Certified Industrial Refrigeration Operator (CIRO), and now CRES.[1]

With regard to CRES, it is hypothesized that refrigeration professionals who become certified via the RETA CRES initiative will have the skills, capabilities, and incentive to optimize the energy efficiency of the refrigeration and other energy-using systems in their respective plants, allowing the industrial facility to capture both energy and cost savings. The expectation is that on-going certification will be sought by refrigeration professionals as business owners come to value improved systems operation and savings captured by CRES-certified staff.

To assess the success of the RETA CRES initiative (to-date), the authors (research team) sought to determine whether the RETA CRES certification has sufficient potential appeal among refrigeration professionals to achieve transformation of the industrial refrigeration plant operations market.

## Methodology

Several data collection activities informed this research study. A summary of the activities appears below (Table 1).

**Table 1. Summary of Data Collection Activities**

| Target Groups | Population | Method | Strata | Sample |
|---|---|---|---|---|
| RETA staff | n/a | Phone in-depth interview | - | 3 |
| Non-CRES certificants (Refrigeration professionals not pursuing CRES) | 740 – 4,000[a] | Web survey; random sample | Non-managers & managers[b] | 53 |
| CRES candidates (Started CRES certification process) | ~ 15 | Phone survey (attempted to reach all) | Non-managers & managers[b] | 10 |
| CRES certificants (Completed CRES certification process) | < 5[c] | Onsite visit, in-person survey (attempted to reach all) | Non-managers & managers[b] | 4 |
| Vendors who serve firms with large-scale / industrial refrigeration systems | Unknown | Phone survey (Purposive sample) | - | 10 |
| **Total** | | | | **80** |

[a] The lower end of the range is based on an average number of refrigeration professionals per facility multiplied by the total number of refrigeration facilities in the Northwest. (This was estimated in the prior 2014 RETA CRES initiative study.) The upper end of the range is based on RETA's staff responses; they estimate between 3,000 to 4,000 refrigeration professionals in the Northwest.

[b] The research team surveyed those who manage refrigeration operations staff (executives and middle managers) and those without any management responsibilities.

[c] Four individuals were CRES certified as of April 2015.

[1] CARO is an entry-level and CIRO is a more advanced American National Standards Institute (ANSI)-accredited credential designed to recognize those with a sufficient knowledge to operate industrial refrigeration systems. CRES is not yet ANSI-accredited, although the Initiative is working toward that objective.

## Appeal of CRES

This section presents findings from telephone, web, or onsite surveys with 53 non-CRES certificants, 14 CRES certificants or candidates, and 10 vendors, as well as findings from in-depth interviews with RETA staff. Please note, where possible, the research team compared non-CRES certificant responses with CRES certificants or candidate responses and reported notable differences. The research team also reported notable response differences between different types of respondents:

- Executives – refrigeration professionals who reported being owners or senior managers of the company,
- Middle managers – refrigeration professionals who reported managing other individuals in the company but were not owners or senior managers, and
- Non-managing refrigeration professionals – refrigeration professionals who had no staff management responsibilities in the company.

Response differences between different types of respondents, when reported, should be interpreted with caution because the small sample sizes of each group limited the ability to identify statistically significant differences.

### CRES Awareness and Promotion

CRES awareness was moderate to high among interviewed refrigeration professionals. The research team examined awareness of the CRES credential among non-CRES certificants and vendors. The research team first asked respondents to report whether they had heard of the CRES credential without providing an explanation of the credential. Thirty-six of 53 non-CRES certificants and four of 10 vendors were aware of the CRES credential. Then, the research team provided a description of the CRES credential to those who had not reported hearing about it, to see if, when prompted, they recalled knowing about it. Among the 17 non-CRES certificants and six vendors who had not heard of CRES, when given a description of the CRES credential, four non-CRES certificants and one vendor recalled hearing about it. Overall, if considering responses to both questions, about three-quarters (40 of 53) of non-CRES certificants and half (5 of 10) of vendors were aware of CRES.

Among non-CRES certificants, executives had the lowest awareness compared to middle managers and non-managing refrigeration professionals (Figure 1). This suggests that the marketing could be optimized to increase awareness of CRES among executives, as they are the key decision makers in authorizing staff training. Almost all (5 of 7) executives reported having the authority to approve staff training, whereas half (14 of 28) of middle managers had this authority in the non-CRES certificant sample.

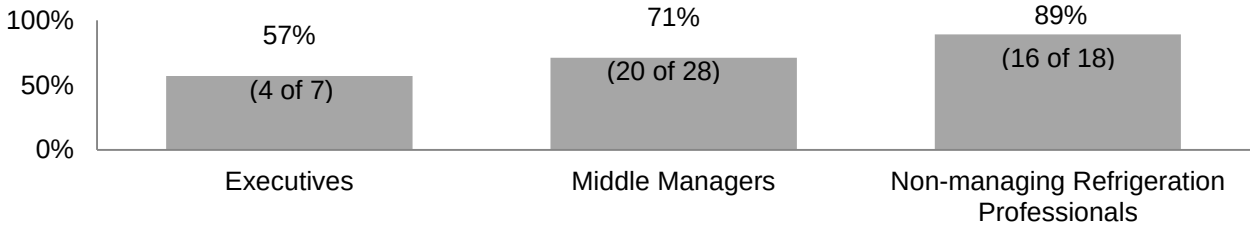



**Figure 1. Awareness of CRES by Type of Respondent (Non-CRES Survey Data)**

Marketing and outreach efforts by a program administrator and RETA are increasing awareness of CRES among refrigeration professionals. CRES certificants and candidates most commonly reported hearing about CRES from either a program administrator representative or through a RETA or program administrator sponsored brochure or flyer (Table 2). All vendors aware of CRES had learned about CRES from a RETA representative.

**Table 2. Information Sources (CRES and Vendor Datasets;[a] Multiple Response Allowed)**

| How did you hear about CRES? | CRES Certificants / Candidates (n=14) | | Vendors Aware of CRES (n=4)[b] | |
|---|---|---|---|---|
| | Count | Percent | Count | Percent |
| From a program administrator representative | 4 | 29% | - | - |
| From RETA/ program administrator sponsored brochure/ flyer | 3 | 21% | - | - |
| RETA meeting | 2 | 14% | - | - |
| RETA conference | 2 | 14% | - | - |
| RETA workshop or training | 2 | 14% | - | - |
| Supervisor | 2 | 14% | - | - |
| From RETA representative | 1 | 7% | 4 | 100% |

[a] Due to survey length constraints, the research team did not ask this question of non-CRES certificants.

[b] One vendor who was aware of CRES but opted not to answer this question was excluded from this analysis.

## Likelihood of Pursuing CRES

### *Interest in CRES*

A notable minority of refrigeration professionals are already considering the CRES credential. Of the 40 non-CRES certificants aware of CRES, 10 (25%) reported they are pursuing CRES. Of these 10 respondents, six were managers (either executives or middle managers) who reported operating refrigeration systems and four were non-managing refrigeration professionals.[2, 3]

The research team, after describing the CRES credential, asked the 14 non-managing refrigeration professionals who were either unaware of CRES or not pursuing CRES to indicate how likely they would pursue CRES now that they knew something about it. Two of these 14 respondents reported they would be likely to pursue CRES in the next two years.

Overall, one-third (6 of 18) of non-managing refrigeration professionals in the non-CRES certificant sample either reported pursuing CRES or willingness to pursue CRES now that they knew something about it.

### *Employer Support for Training*

Both the CRES certificant and candidate survey and non-CRES certificant survey asked executives and middle managers to report the percentage of their staff with access to employer-

[2] Of six managers pursuing CRES, five were middle managers and one was an owner of a refrigeration plant.

[3] One non-CRES certificant said he was CRES certified. Because this contact was not on the list of CRES certificants, the research team excluded this response from the count of those pursuing CRES.

provided training support and the percentage of staff using such support for certification training. Executives and middle managers in both surveys reported that more than three-quarters (88% and 78%, respectively) of their staff had access to employer-provided support for training and development (Table 3). In contrast to the proportions of staff with access, smaller proportions of staff (69% and 48%, respectively) had used that support for certification training.[4] Also of interest is the apparent difference between the CRES and non-CRES certificants or candidates. CRES-certificants or candidates appear both (1) to have greater access and (2) to use employer-provided support for certification training more than non-CRES certificants (as evidenced by the sample means in Table 3).

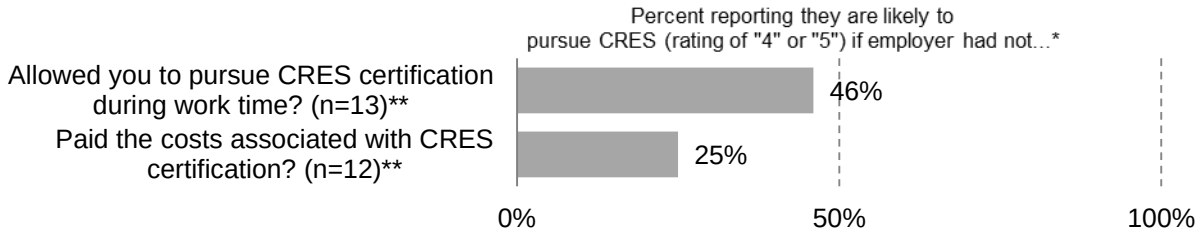
**Table 3. Staff Access to and Use of Employer-Provided Training Support, Manager Perspective (CRES and non-CRES Datasets)**

| | Executives and Middle Managers Who Were: | |
|---|---|---|
| | **CRES Certificants / Candidates (n=9)** | **Non-CRES Certificants (n=33)[a]** |
| Average % of staff with access to employer-provided support for training and development | 88% | 78% |
| Average % of staff who have used employer-provided support for certification training | 69% | 48% |

[a] Two respondents opted not to answer these two questions. Missing data excluded from this analysis.

### *Importance of Employer Support for CRES*

Refrigeration professionals will need financial support from employers to pursue CRES. All 14 CRES certificants or candidates reported their company paid or will pay the costs associated with CRES and allows them to pursue CRES during work time. A minority reported they would have pursued CRES if their company had not paid for the costs, and less than half were willing to pursue CRES if their employer decided to not allow them to pursue CRES during work time (Figure 2).




[4] Respondents used 0%, 1-25%, 26-50%, 51-75%, and 76-100% response categories when answering this question. To estimate the average percent across these responses, the research team calculated the mid-point of each response category and assigned the appropriate mid-point value to each respondent's answer.

**Figure 2. Willingness to Pursue CRES without Employer-provided Support (CRES Certificant/Candidate Data)**

* Answers provided using a scale from 1 (not at all likely) to 5 (very likely).

**Some respondents opted not to answer these questions. Missing data excluded from this analysis.

Analysis of the non-CRES certificant survey data revealed a similar pattern. Of 18 non-CRES certificants who were non-managing refrigeration professionals, four reported pursuing CRES. Of these four individuals, all noted their employer will pay the costs associated with certification and nearly all (3 of 4) said their employer will pay the costs and also allow them to pursue CRES during work time. Of the other 14 non-managing refrigeration professionals who reported not pursuing CRES, more than half noted they would likely pursue CRES if their employer paid the costs associated with the certification (Figure 3). This percent increased only slightly when asked whether they would pursue CRES if their company paid the associated costs and allowed them to pursue CRES during work time (Figure 3).

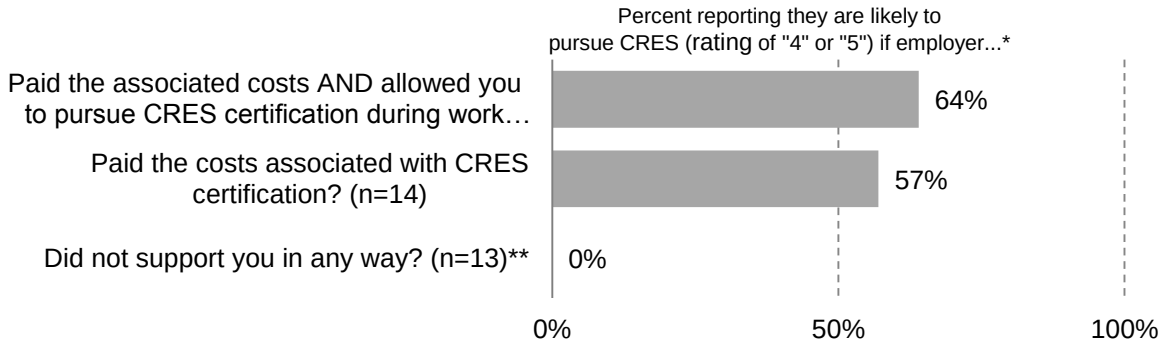



**Figure 3. Willingness to Pursue CRES among Non-managing Refrigeration Professionals Who Are Currently Not Pursuing CRES (Non-CRES Certificant Survey Data)**

* Answers provided using a scale from 1 (not at all likely) to 5 (very likely).

**Missing data from one respondent.

The non-CRES certificant survey also briefly described the CRES certification process to executives and managers and asked them how likely their company would be to pay for or support various elements of CRES training. Several findings emerged from these data.

Employers are less open to support elements of CRES that require refrigeration professionals to be away from their jobs during work time. Executives and middle managers reported a lower likelihood that their companies would pay for training time than pay for costs associated with CRES (Figure 4). This suggests that there is an opportunity to alert managers to the immediate efficiency benefits gained from operators conducting projects at the workplace that lead to certification.

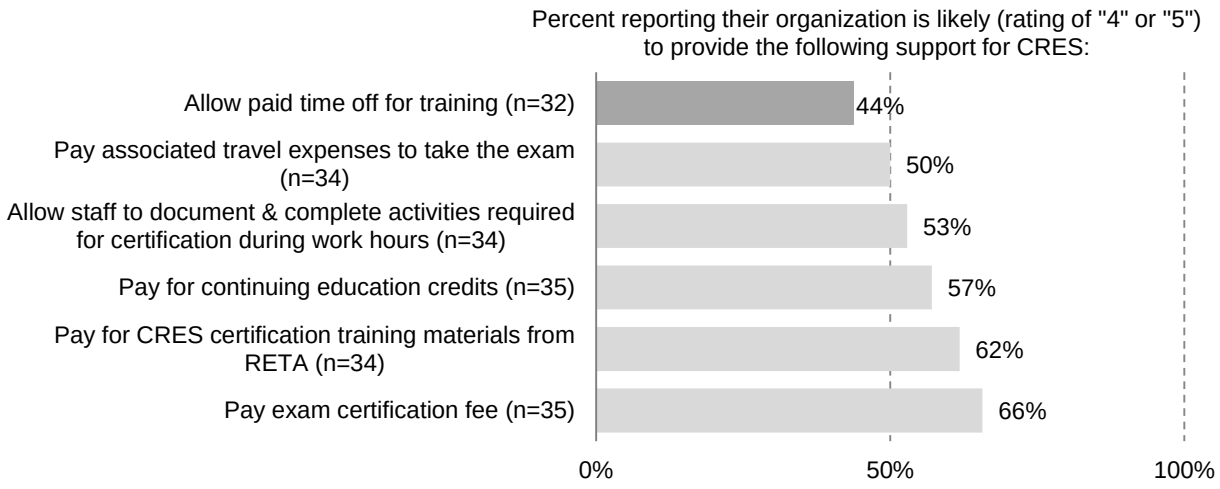



**Figure 4. Likelihood that Employer will Provide Support for the Following Elements of CRES, Manager Perspective (Non-CRES Certificant Survey Data)[*, **]**

* Answers provided using a scale from 1 (not at all likely) to 5 (very likely).

** Some respondents failed to answer these questions. Missing data excluded from this analysis.

## Value of CRES

### *Motivations for CRES Adoption*

RETA staff contacts identified energy savings and sustainability as the primary motivations of companies to have their refrigeration operations staff obtain the CRES certification. With regard to energy savings, contacts believe that once managers see how the CRES certification can save the company money, they would be motivated to support their staff in obtaining the certification. One contact stated, "The certification of refrigeration professionals leads to a reduction in electrical usage and energy savings equal money savings." With regard to sustainability, contacts reported that the certification is a way to show corporate commitment to sustainability. As one contact explained: "Sustainability is the biggest reason companies likely want to do this. They are not only saying they are sustainable, but are able to show through the certification that they are doing it."

The added skills or technical knowledge that refrigeration professionals would gain by being CRES certified is another reason why refrigeration professionals are interested in CRES. Two RETA contacts mentioned the desire for refrigeration professionals to better themselves by increasing their knowledge of and skills in refrigeration operation and energy efficiency.

### *Perceived Benefits of CRES*

The majority of CRES certificants or candidates pursued CRES to improve their skills (Table 4). The second reason for pursuing CRES was to increase their job opportunities.

**Table 4. Motivations to Pursue CRES (CRES Certificant/Candidate Survey Data, n=14; Multiple Response Allowed)**

| Why did you decide to become CRES certified? | Count | Percent |
|---|---|---|
| To improve my skills | 10 | 71% |
| More job opportunities at current company or elsewhere | 4 | 29% |
| To get better pay | 3 | 21% |
| To be promoted | 3 | 21% |
| Related to field | 2 | 14% |
| Other | 2 | 14% |

### *Importance of Certifications When Hiring New Staff*

Both the CRES certificant and candidate and non-CRES certificant survey asked executives and middle managers to report which certifications or training they consider when hiring refrigeration operations staff. Executives and middle managers in both surveys reported that CARO or CIRO certifications are most commonly considered when hiring new staff (Table 5).

Four of 10 vendors, when asked what their clients consider when selecting a vendor, reported their clients consider either CARO or CIRO and two reported their clients look for both CARO and CIRO.

Managers who were CRES-certificants or candidates were more likely than non-CRES certificant managers to consider RETA certifications when hiring staff. In particular, managers who were CRES certificants or candidates were approximately twice as likely to report they would consider CARO or CIRO when hiring staff than non-CRES certificant managers (Table 5).

**Table 5. Considerations When Hiring Staff, Manager Perspective (CRES and Non-CRES Datasets; Multiple Response Allowed)**

| Which certifications or training do you consider when hiring refrigeration operation staff? | Executives and Middle Managers Who Were: | | | |
|---|---|---|---|---|
| | CRES Certificants / Candidates (n=9) | | Non-CRES Certificants (n=35) | |
| | Count | Percent | Count | Percent |
| CIRO | 8 | 89% | 16 | 46% |
| CARO | 8 | 89% | 15 | 43% |
| CRES | 3 | 33% | 7 | 20% |
| Refrigeration Operator Coaching | 3 | 33% | 4 | 11% |
| Other Education / Training / Licenses | 5 | 56% | 3 | 9% |

To explore managers' receptiveness to CRES, both the CRES certificant and candidate survey and non-CRES certificant survey asked managers how influential would CRES be on their decision or recommendation of who to hire if they interviewed two similarly qualified candidates for a refrigeration operator position, but one of the candidates was CRES certified while the other was not. Using a 5-pt scale where 1 meant "not all influential" and 5 meant "extremely influential," about

half (19 of 35) of non-CRES certificant managers and about two-thirds (6 of 9) of CRES certificant or candidate managers noted CRES would influence (a rating of "4" or "5") their decision of who to hire.

Executives need more convincing of the value of CRES. Less than half (2 of 7) of executives, compared to more than half (17 of 28) of middle managers in the non-CRES certificant sample, noted CRES would influence their decision of who to hire when asked about the hypothetical scenario referenced above. Similarly, among CRES certificants or candidates, half (2 of 4) of executives and nearly all (4 of 5) middle managers noted CRES would influence their decision of who to hire.5

Additionally, fewer executives than middle managers in the non-CRES certificant sample reported their company values training staff to operate refrigeration systems efficiently, while more executives than middle managers reported their company values on-the-job training more than certifications (Figure 5). These findings suggest a need to develop effective "value proposition" messages around CRES for executives.

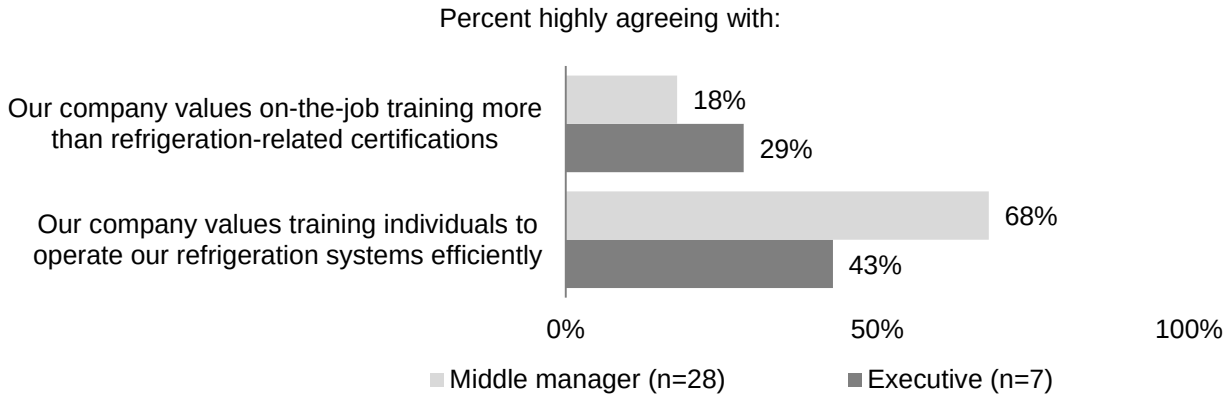



**Figure 5. Perceptions about Training (Non-CRES Certificant Survey Data)**

Four of 10 vendors also reported considering certifications when hiring new staff. Three reported they consider the CARO certification, and all four said they consider the CIRO certification. Six vendors who reported not looking for specific certifications when hiring new staff said the certifications are uncommon among refrigeration professionals. One vendor reported that in the past, certifications were not an important consideration, but with the new Occupational Safety and Health Administration (OSHA) requirements, these are becoming more important in hiring and also more important to his customers. Others reported they have been asked about the certifications of their employees in the proposals and that new clients tend to be the ones asking about such certifications.

### *Value of Operating Equipment Efficiently*

Vendors are selling energy efficiency services to their clients. All vendors reported selling energy efficient products and services. These products and services were reported to

[5] It is important to note that executives value certifications. The key finding here is that they value it less than middle managers.

account from a low of 5% to a high of 100% of annual revenues.[6] Eight of the 10 respondents reported a proportion of annual revenues associated with energy efficient products and services of 25% or less; the average value across all ten vendors was 28%. Nearly all (8 of 10) vendors reported that annual revenues associated with energy efficiency products and services have increased over the past two years. Seven of 10 also noted that the energy efficiency products and services they offer were important in differentiating them from some of their competitors.

Refrigeration professionals also reported increasing importance of energy efficiency. More than two-thirds of managers (this group includes both executives and middle managers) noted their companies have focused on increasing energy efficient operations of the refrigeration systems in the past five years (Figure 6).

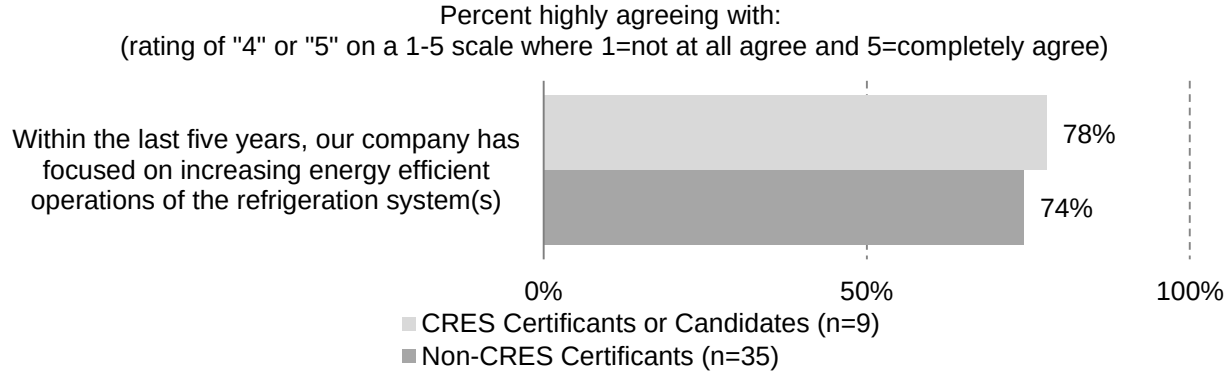



**Figure 6. Perceptions about Energy Efficiency, Manager Perspective (CRES and Non-CRES Survey Data)**

More non-managing refrigeration professionals value operating equipment efficiently than managers. More non-CRES certificant managers than non-managing refrigeration professionals agreed with the statement "optimizing energy use is less important than hitting operational targets such as production quotas" (Figure 7). This suggests that messaging around energy efficiency aspects of CRES should be linked with other refrigeration operation considerations that are important to managers.

[6] Energy efficient products and services include custom refrigeration design, controls and software design, installation, safety training, remote system monitoring, repair, and maintenance.

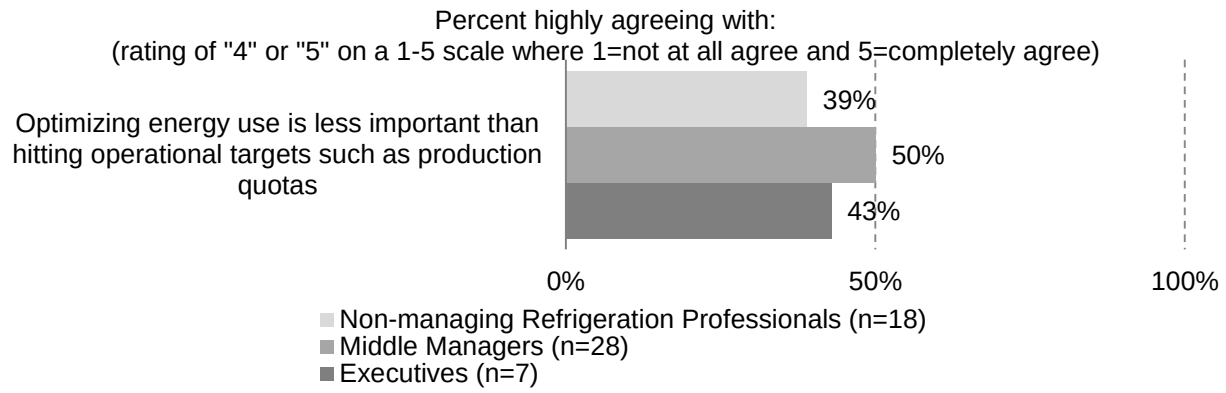



**Figure 7. Perceptions about Energy Efficiency and Productivity (Non-CRES Survey Data)**

## Experience with CRES

Four CRES certificants and 10 CRES candidates reported on their experience with CRES certification process. More than half (8 of 14) of CRES certificants or candidates reported at least one aspect of CRES did not go smoothly for them. Respondents most commonly mentioned that training covered in the class or study materials was not adequate to prepare individuals for passing the exam successfully (five mentions).

The difficulty of the exam is a barrier to CRES adoption. Nearly half (4 of 10) of CRES candidates are anticipating completing requirements for CRES at the end of 2015. However, nearly one-third (3 of 10) of CRES candidates (i.e., surveyed individuals that the research team terms CRES candidates) are no longer pursuing CRES. These individuals have taken the exam and failed it, and they reported concerns over ability to pass the exam without additional training and difficulty in finding time to complete and document five energy efficiency activities (Table 6).

**Table 6. Where are Candidates in the CRES Certification Process (CRES Candidate Survey Data, n=10)**

| Where in Process | Count | Percent |
|---|---|---|
| No longer pursuing CRES | 3 | 30% |
| Preparing to take the exam again | 2 | 20% |
| Documenting 5 energy efficiency activities | 2 | 20% |
| Just started | 1 | 10% |
| Submitted all the paperwork on 5 energy efficiency activities | 1 | 10% |
| Other | 1 | 10% |

A RETA staff contact also noted that the CRES exam is very difficult. Because there are no prerequisites for the exam, the exam includes refrigeration elements that would be covered under CARO or CIRO. (This was intentional because a program implementer collaborating with RETA did not want to add a prerequisite and potentially hinder some individuals from pursuing

CRES and RETA wanted to ensure that those pursuing CRES had adequate knowledge of refrigeration safety and reliability.) Another contact reported that there is no handbook or materials to prepare for the test outside of information from the class. The website has a brief application handbook that references eight different study materials available from RETA, with a caveat that, "RETA does not endorse or guarantee that all content areas in the CRES exam are covered in those materials" (RETA 2013). This contact reported that a difficult test paired with limited study material will not hold back the "superstars," but it will likely hold back other refrigeration professionals.

## Conclusions and Discussion

This study revealed four key insights on what the RETA and the program evaluator should do to improve the penetration of CRES certification in the market:

1. **Executives need more convincing of the value of CRES.** Energy efficiency as it relates to industrial refrigeration operation does not appear to be a top priority to executives. They were the least aware of the CRES credential. Less than half of them reported that CRES would influence their hiring decisions and they were more likely than non-managing refrigeration professionals to describe meeting operational targets as more important than optimizing energy use.

   Considering that executives are key decision makers in authorizing staff training, CRES marketing should be optimized to; 1) increase awareness of CRES among executives; and 2) include effective "value proposition" messages around CRES. Messages linking energy efficiency with other considerations important to executives (for example, safety, and productivity) are likely to be effective.

   Please note that middle managers also are key decision makers in authorizing staff training (nearly half of middle managers in the non-CRES certificant sample reported having this authority). Thus, those involved with the promotion of RETA CRES initiative should ensure they have marketing strategies and materials tailored to different types of decision makers.
2. **Non-managing refrigeration professionals will need employer-provided support to pursue CRES.** All CRES certificants or candidates reported their company paid or will pay the costs associated with CRES and allows them to pursue CRES during work time. Analysis of the non-CRES certificant survey data revealed a similar pattern. Of 18 non-CRES certificants who were non-managing refrigeration professionals, four reported pursuing CRES. Of these four individuals, all noted their employer will pay the costs associated with certification. Of the other 14 non-managing refrigeration professionals who reported not pursuing CRES, more than half (57%) noted they would likely pursue CRES if their employer paid the costs associated with the certification. This percent increased only slightly, to 64%, when asked whether they would pursue CRES if their company paid the associated costs and allowed them to pursue CRES during work time.

   These findings suggest a need for providing financial support for the CRES exam, preparatory classes, or training materials to encourage those without access to employer-provided support to pursue CRES.
3. **Employers are reluctant to support elements of CRES that require refrigeration professionals to be away from their jobs during work time.** Executives and middle managers reported a lower likelihood that their companies would pay for training time than

pay for costs associated with CRES. Given this finding, the CRES value proposition should alert managers to the immediate efficiency benefits gained from operators conducting the projects that lead to certification.

4. **Refrigeration professionals will benefit from additional support in preparing for the exam.** Nearly one-third of CRES candidates are no longer pursuing CRES; these individuals did not pass the exam. They reported concerns over ability to pass the exam without additional training. RETA staff noted that there is no handbook or materials to prepare for the exam outside of information from the preparatory classes. One RETA contact explained that a difficult test paired with limited study material will not hold back the "superstars," but it will likely hold back other refrigeration professionals.

   Several CRES certificants and candidates provided suggestions on what type of training or study materials would have helped them to prepare for the CRES exam:

   - More time when taking the exam
   - More online training or study materials, including a sample test, to prepare for the exam
   - More preparatory classes; have instructors cover all relevant topic areas in preparatory classes

## References

[RETA] Refrigerating Engineers & Technicians Association. 2013. CRES Certification Exam Application and Handbook (pg. 5). Retrieved from http://c.ymcdn.com/sites/reta.com/resource/collection/7E8C8BAA-2E34-44B1-9FC7-E5C0FD28B9E2/original_12-06-2013_CRES_Certification_Application_handbook_REV3.pdf

Research Into Action, Inc. 2014. RETA CRES Initiative: Market Characterization, Baseline Study, and Forecast Report. Retrieved from http://neea.org.