The Geezers and the Geeks: Passing the Thumb Drive of Energy Efficiency Knowledge

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ABSTRACT

Over 30 years ago, Energy Efficiency (EE) began its evolution from a presidential appeal for personal sacrifice to the first priority resource for utilities across the country. During this period the first wave of analysts, planners, program managers and evaluators faced and resolved countless technical, political, economic and environmental issues. This first generation created the foundational principles, practices and understanding of EE as a resource. This set the stage for successful conservation programs that have survived immense industry change.

A large cohort of these weathered experts has or soon will retire, taking with them over three decades of institutional knowledge, lessons learned, and historical perspective. A new generation of young, talented and enthusiastic professionals are now entering the EE field, eager to grow the ”green” economy. Unfortunately, without a well-defined succession plan the knowledge and experience of the “elders of EE” is likely to be lost. This puts the next generation at risk of making unnecessary mistakes and re-creating years of work rather than building on its foundation.

This paper will illustrate the type of lessons that need to be passed on to the next generation through the example of understanding and dealing with the ebbs and flows of energy efficiency funding and support in the Pacific Northwest. Most important of these are: the underlying value of EE as a resource; key lessons learned from major undertakings of the past; and the core principles required to defend EE as a resource. The paper will then note the challenges in passing on this information, and suggest potential solutions for ensuring that this knowledge is effectively transferred to this next generation.

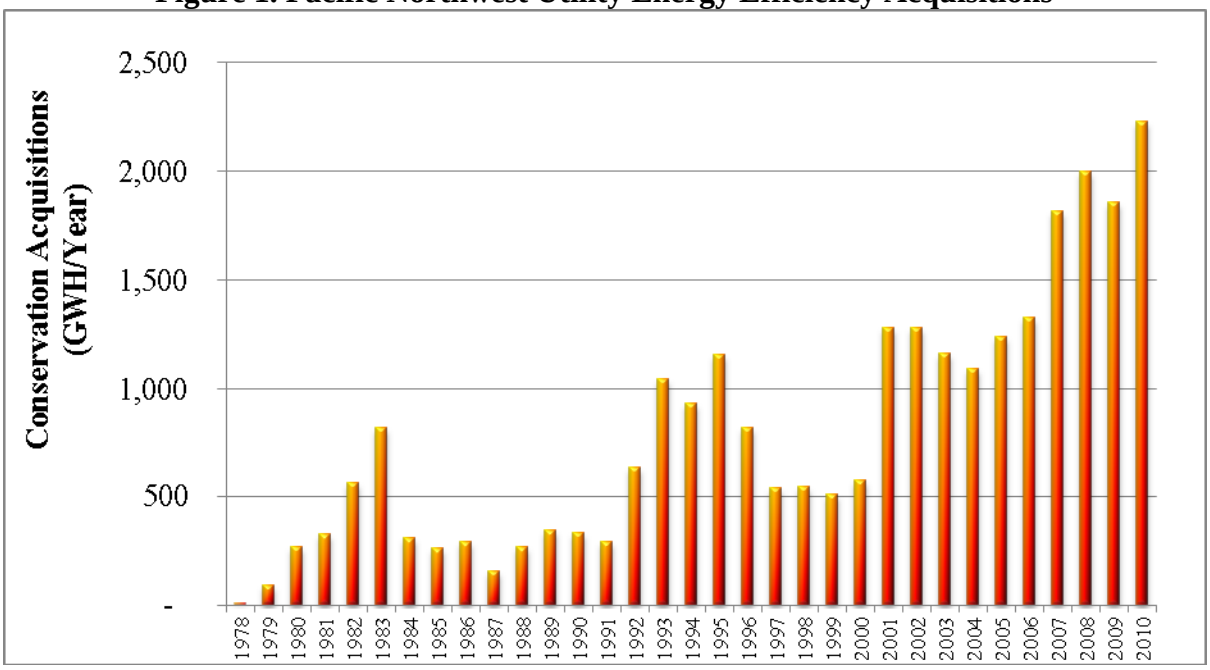
Introduction

The 1970’s brought two OPEC oil embargos and extraordinary rate increases resulting from utility investments in new nuclear and coal fired generation facilities. Along with this came heightened environmental concern about the impacts of energy development. It is during this period that the first wave of analysts, planners, program managers and evaluators entered the energy efficiency field. These individuals faced and resolved countless technical, political, economic and environmental issues about energy efficiency as a substitute for electric generation. This first generation articulated the foundational principles, practices and understanding of EE as a resource. They set the stage for successful energy efficiency programs that have survived immense industry changes.

As illustrated in Figure 1, in the Northwest region, the utility industry’s focus on and investments in energy efficiency has ebbed and flowed over these past three decades. This

created boom and bust cycles that were not conducive to sustained career development.[1] While some of the energy efficiency trailblazers weathered the equivalent of "Mr. Toad's wild-ride" through multiple energy efficiency business cycles, this volatility made employers hesitant to grow the size of their staff, and discouraged newcomers from pursuing energy efficiency as a career path.[2] This volatility, coupled with the extended period between the "peaks" of the energy efficiency business cycle resulted in an EE generation gap; on one side, the "geezer," with over 25 years of experience in the energy efficiency field and the "geeks," with less than five on the other.

Figure 1. Pacific Northwest Utility Energy Efficiency Acquisitions



As is true for the electric utility sector generally, a large cohort of these seasoned energy efficiency experts has or soon will retire, taking with them over three decades of institutional knowledge, lessons learned, and historical perspective.[3] In the area of energy efficiency, these experienced personnel are being replaced by individuals, who while talented and highly motivated, have limited knowledge of the lessons learned by those who preceded them in the efficiency field. In particular, as detailed in this paper, one of the important lessons to ensure is passed on to next generation is the experience and lessons that were learned while going through the historical ebb and flow cycles of EE.

As this next generation of "efficiency geeks" takes up the challenge of sustaining and growing the country's energy efficiency resource portfolio, it is essential that they build on the knowledge and experience of the "geezers of EE" before it is lost.

[1]Northwest Power and Conservation Council, Historical Conservation Achievements 1978-2010.

[2] Between 1996 and 1999, the Energy Efficiency FTE at Bonneville Power Administration went from 365 to about 70. (Personal communication from Ken Keating.)

[3] Nationally, 50 percent of electric utility workers are projected to retire over the next 10 years. This represents a loss of some 200,000 experienced workers. See: Hardcastle, Alan. "Workforce challenges of Electric Sector Employers in Washington and Oregon," Washington State University Extension Energy Program. January 2008.

Energy Efficiency Business Cycle Drivers

Over the past five years, the 'geeks' have entered into a flourishing EE industry, with unprecedented budgets, political support, and previously unheard of resources for achieving aggressive efficiency goals. Yet, being aware of EE's unstable past, newcomers are beginning to wonder when the bubble will burst.

It is more important to understand the causes of booms or busts in order to be prepared with the appropriate response than it is to predict the exact timing of when "it's gonna blow" or is "about to crash." The following describe the three major factors that the 'geezers' have observed that drive energy efficiency investment cycles.

Energy Costs

Actual changes in or forecast changes to the cost of new electricity supplies are the most significant driver behind the dramatic fluctuations in energy efficiency investments. The national energy crises of the 1970's and the West Coast in 2000-2001 led to immediate and dramatic increases in the demand for investments in energy efficiency. The increase in natural gas prices between 2002 and 2008 led to significant increases in gas efficiency programs. For example, according to ACEEE's 2010 State Energy Efficiency Scorecard, spending on natural gas efficiency programs tripled between 2007 and 2009. Similarly, low wholesale electricity prices in mid-to-late 1990's on the West Coast, combined with a shift in public policy (i.e., electric industry restructuring) led to a dramatic reduction in Northwest utility investments in energy efficiency. This trend was abruptly altered when average monthly wholesale market prices increased from $25/MWH to over $600/MWH over a period of less than nine months. In response, Northwest utility energy efficiency acquisitions more than doubled between 2000 and 2001.

Economic Cycles

Economic business cycles are the second major factor directly affecting the ebb and flow of energy efficiency investments. During times of economic growth, energy demand also grows, increasing the perceived need for new power supplies. In times on economic recessions, utility electricity loads can remain flat or even decline. A "lesson learned" (and later demonstrated to be a mistake) was that achieving 'resource' status for energy efficiency is a two–edged sword – like other resources, you don't build them if you don't think you need them.

As a direct result of a regional recession and a 316% increase in wholesale electric rates from misplaced ventures in nuclear power in the late 1970s, Northwest utility load growth dropped dramatically and energy efficiency programs experienced over a 50 percent reduction in investments and savings between 1983 and 1984.[4] Annual savings remained at a reduced level until the early 1990's, as regional retail sales remained virtually unchanged from 1981 to 1987. Conversely, an economic boom of the early 1990's in the Northwest resulted in a threefold increase in utility annual efficiency achievements between 1991 and 1993, largely due to concerns about "looming power shortages." This correlation between economic cycles and utility

[4] Between 1978 and 1984 Bonneville Power Administration's average wholesale electric rates increased from .08 to 2.27 cents per kilowatt-hour after accounting for inflation.

energy efficiency investments can be seen above in Figure 1, which shows the annual Northwest utility program savings for the years 1978 through 2010.

Public Policy

An energy crisis, whether brought on by the OPEC oil embargos of the 1970's or the West Coast electricity market "meltdown" in 2000-2001, results in changes to public policies that can (but does not always) favor increased energy efficiency investments. Public policy responses to environmental concerns also drive increased investments in energy efficiency. For example, oil embargoes, environmental concerns over the safety of radioactive waste storage of nuclear power, acid rain, and other air pollution from coal-fired plants were driving factors in the initial ramp up of utility energy efficiency activities in the late 1970's and early 1980's. The eventual decision by US Department of Energy to support the least cost planning paradigm was a big boost to the acceptance of energy efficiency as a resource. Similarly, the desire to reduce the greenhouse gas emissions of the power sector has driven more recent surges in efficiency investments. According to ACEEE's 2011 State Energy Efficiency Scorecard, 24 states have adopted or are well on the way to establishing energy efficiency resource standards.[5]

What We Learned on the Way Up

Taking Advantage of the Boom

No matter the cause, times of boom lead to opportunities in energy efficiency that should be exploited to the fullest extent possible. The following section describes some of the opportunities presented during the "good times" for EE.

Increased Funding. The biggest opportunity that results from a "boom cycle" is the increased funding and financial support for energy efficiency. This increased funding provides the opportunity to research, design, and implement efficiency acquisition programs at scales not possible during leaner times. For example, during the West Coast energy crisis of 2000-2001, the Northwest Energy Efficiency Alliance (NEEA) was able to negotiate an upstream "buydown" with CFL manufacturers that increased CFL sales from under 350,000 in 2000 to over 5.5 million lamps in 2001. Similarly during the early 1990's, the robust budgets available for energy efficiency allowed the utilities in the Northwest to form a consortium to acquire energy savings in new manufactured housing by contracting directly with the manufacturers. This collaboration resulted in the region's 18 producers of manufactured housing building all Northwest-bound electrically heated manufactured homes to the most efficient levels in the country.

Greater funding for energy efficiency also permits increased investments in both research and development and the chance to test alternative approaches for delivery. For example, when NEEA's sponsors agreed to double its funding levels for 2010-2014 compared to 2005-2009, the organization's budget for emerging technology quadrupled.[6] As a result NEEA will now be more able to "keep the energy efficiency pipeline" filled with new technologies for regional programs.

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[5] *Ibid*, at 16

[6] NEEA's budget for emerging technology is $20 in its 2010 -2014 Business Plan versus less than $5 million in its 2005-2009 Business Plan. Personal communication with Jeff Harris, NEEA's Director of Emerging Technology.

With increased funding also comes the opportunity to increase staff resources. Facing the doubling of regional savings targets the Bonneville Power Administration hired additional staff for the first time since the 1990's. As stated in the Bonneville Power Administration (BPA) 2010 EE Action Plan, in one year, BPA increased the number of energy efficiency staff by nearly 30%.

High Energy Prices. The cost-effectiveness of energy efficiency investments should be judged based on long-run avoided resource costs and risk. Despite this fact, short-run market prices bias perceptions of the need for energy efficiency. Both long and short term factors ultimately affect management support for EE. When market prices are higher, there is less risk associated with including efficiency measures that are further up the "supply curve" in programs. The additional "head room" provided by higher avoided cost also encourages utilities to pay higher incentives. They also feel comfortable testing alternative program delivery systems that may have a more expensive start up cost, but result in lower cost acquisitions over time. The increased management support that comes with higher energy prices manifest itself in permission to take on these higher risk initiatives and exploration of new technologies.

Significant expansions in investments in energy efficiency bring higher visibility and the concern for better oversight. Therefore, it is critical that as investments in energy efficiency acquisition increase, that they be accompanied by parallel increases in the budget for and attention to thorough planning, evaluation, measurement and verification.

What to Avoid During the Boom Times

Energy efficiency booms have almost always arrived suddenly and with immediate demand, creating a chaotic atmosphere of growth, quick decision making, and drastic ramp up of programs. For example, the Northwest has experienced at least three "boom" periods since 1980 (Figure 1). In each instance, annual savings increased between 100 and 300 percent over one to three year periods. One of the many benefits of efficiency is that it can be ramped up quickly. Yet with fast growth and immediate need comes the risk of inadequate planning, poor decision making and missed opportunities, resulting in inefficient or uneven achievements. Some of the biggest risks to avoid include losing rigor in savings, developing unsustainable programs, and producing insufficient evaluations.

Losing Rigor in Savings. Making sure that the savings are measurable, reliable, and sustainable is critical to the credibility and longevity of the efficiency industry. Moving too fast can result in poor technology development and deployment, rushed program planning, and lower standards for evaluation, measurement and verification. In times of immediate need, management may be willing to take on too much risk, bypassing critical details in program design, measure specification and other tasks that require additional time and resources to develop. For credible program savings, due diligence is needed to establish baseline energy use and estimates of measure savings, as well as, quality-control procedures to ensure that measures are properly installed and functioning. In addition, the field needs evaluation, measurement and verification protocols.

Developing Unsustainable programs. There is also a risk of developing programs that are unsustainable. If programs are developed and ramp up too quickly without proper planning or

clear implementation strategy, they can become unsustainable over the long run. Rapid ramp-up has been achieved in some programs. However, the need for infrastructure, trained personnel, competitive supply chains, proper quality controls, and a full understanding of the market can result in half-formed, ineffective programs that give energy efficiency a bad name in the market. Even if these inefficient programs can be scaled up, they are likely to result in higher acquisition costs than necessary. It is important to take the time to develop programs that can be maintained over the long run and fit within given budgets, even if the budgets are large. Doing so will permit such programs, and careers, to be more easily sustained should EE budgets be reduced.

This is not only a Pacific Northwest policy issue, but examples abound throughout the US. The Tennessee Valley Authority has had similar swings in investments in energy efficiency between the late 1980's and the present. California had peaks of spending on energy efficiency in 1984, 1993, 2001, and 2006. At the current time, many parts of the country are dealing with the whiplash created by the "roller coaster" of American Recovery and Reimbursement Act (ARRA) funding that stimulated energy efficiency activity in many jurisdictions but will soon end.

Over-Promising. As with many endeavors, swings in fashions can lead to over-promising the public, managers, and regulators. The use of unexamined assumptions has led to claims for nuclear energy that it was "too cheap to meter." Similar claims have been made and similarly exposed in the field of energy efficiency. When the data finally come in, whether on the costs and risks of nuclear plants or the disappointing savings of some energy efficiency measures, there will be a backlash. When too much is promised, the backlash can be a major obstacle for later increases in funding or the promotion of new measures.

Insufficient Evaluation. In addition to adequate program planning, developing robust evaluations is the key to ensuring that the savings reported were actually achieved. Evaluation also allows programs to identify areas for improvement to ensure continued success. Poorly developed or even sometimes non-existent evaluations can be the victim of a program that moved too quickly. When large organizations enthusiastically adopt energy efficiency goals, they often set up unrealistic expectations based on unevaluated assumptions that get passed down the chain of command. In some cases personal incentives and promotions are tied to successful achievement of publicly endorsed goals. In such cases, it is in no one's interest to spend a lot of money, effort, and bureaucratic chips to establish a rigorous and independent evaluation function. It is an unfortunate irony that the type of ebullience that supports quick growth in programs is not the best atmosphere for evaluation. As efficiency savings become a larger portion of resource portfolio, it is increasingly important that we are able to back-up our claimed savings with robust evaluations.

Not Writing it Down. During times of quick decision making and hurried implementation, there is often little time and concern to document key decisions, plans, or lessons learned. Even in writing this paper, a vast majority of the information provided was not through documented research, but through personal communication between the "geezers" and the "geeks." In order to help ensure that the next generation does not repeat the mistakes of the generation before it, it's critical that the important components to the successes (and failures) of efficiency acquisition is written down (and saved somewhere where it can be found).

What We Learned on the Way Down

Don't Oversell the Flexibility of Energy Efficiency

The fact that energy efficiency resources are more flexible than conventional large nuclear or coal-fired generation has been characterized as a highly valuable attribute. According to the Northwest Council's 1983 Plan:

Conservation is the most flexible resource because it has both a short lead time (once a program has been designed and tested it can be quickly scaled up or down) and it can be acquired in small increments, each of which begins generating (saving) energy immediately.

As can be seen from Figure 1, over the past 30 years, nearly every boom in Northwest utility energy efficiency achievements has been followed by a period of decline in annual savings from energy efficiency (following a decline in budgets). Up until the Council began development of its Fifth Regional Power Plan in 2002, the fact that energy efficiency was ramped up and down through these cycles was simply taken as evidence that it was indeed a highly flexible resource. However, analysis done to support the Council's Fifth Plan found that ramping down the acquisition of energy efficiency programs in response to low market prices or economic downturns actually increased the long-term cost and risk of the Northwest power system.

This is because energy efficiency accomplished during periods when market prices are low or loads are down provides economic value by being in place when periods of high prices return. This was also one of the lessons of the 2000-2001 West Coast energy crisis. If efficiency programs are "ramped down" until prices spike, there isn't time to get the needed efficiency resources in place effectively. This means high levels of efficiency development should be sustained rather than following the traditional boom-bust cycles.[7]

What If My Budget Still Gets Cut?

Over the years, there has been a pattern in the triggers that have reduced energy efficiency investments. Through the many booms and busts, those "geezers" who weathered these swings developed arguments to mitigate the risk that efficiency programs would be reduced or cut completely in times of economic downturn and low market prices.

As noted, the Northwest experienced flat loads and a persistent power surplus, from 1981 through 1987 (much like what is occurring today). The region's utility managers argued that if there was no need for new resources, then acquiring energy efficiency resources was not justified. To counter this assertion, efficiency staff developed the concept of "lost-opportunity resources" as a rationale for sustaining investments in efficiency even during surplus periods. This concept evolved out of the recognition that it was cheaper to build buildings correctly than to retrofit them late and that long lasting inefficient appliances and equipment would be a burden on the system for years if they weren't made efficient at the time of purchase. Today the concept of sustain EE investments in lost-opportunity resources is accepted as industry standard practice as the way to ensure that some level of energy efficiency acquisition is maintained during time of

[7] The Fifth Northwest Electric Power and Conservation Plan. Volume 2: Supporting Data and Analysis. Portfolio Analysis and Recommendations, p 7-15. Northwest Power and Conservation Council, May 2005. http://www.nwcouncil.org/energy/powerplan/5/(07)%20Portfolio%20Analysis.pdf

power surpluses. It is important that the next generation of EE experts understand its origins so they are better able to articulate reasons for sustaining EE investments the next time the "bust" cycle comes around and efficiency budgets are again threatened.

A second concept, "capability building" was also developed during the first major downturn in Northwest EE investments to ensure that the infrastructure being created would be able to ramp up a broad range of efficiency programs as the economy began to recover and the need for power grew. The Council stated in the 1983 Plan that:

"In recognition of the current surplus of electricity, the primary focus of the plan over the next two years is to develop and test conservation programs in all sectors of the economy so that these programs will be reliable and available when the region needs additional power"[8].

Another key concept that became clear when prices spiked suddenly was the value of conservation as a risk-mitigation strategy. Just as energy efficient building codes protected against large increases in demand when the economy builds a lot of floor space quickly, the continuation of efficiency acquisitions reduced the chances of major peak demand events and reduced the volatility of energy prices when demand spikes as they did in throughout the Western power market in 2001.

The pioneering EE cohort articulated these and other reasons to sustain EE in times of doubt and decline. As this group begins to retire, the utility managers that were educated on these topics will follow the same path. While these managers were convinced over many years of the value of energy efficiency, it will be up to the "geeks" to educate new management and utility staff on these key issues and lessons learned.

How Do We Share It?

One of the keys to not repeating the mistakes of the past is to ensure that the next generation learns from the experiences of those with a history in the industry. It is critical that we are able to pass on this information before it gets lost in the minds, papers, and computers of those preparing to retire. The challenge in this is recognizing the critical pieces of information, and how it will get transferred.

Knowing What to Pass On

With over 30 years of experience, the amount of knowledge and information to be transferred is likely too much to be able to share it all. In addition, industry experts do not typically sort their wealth of knowledge into categories of 'must pass down to future generations' and 'not as important for the next generation to know.' Often times the problem can be circular; when geeks ask the geezers 'what is important for me know', the common response can be 'well, what do you want to know about?' One key role that upcoming retirees can play is to note the types of reoccurring questions that arise from new industry entrants. This tracking of common questions can help identify critical areas of information to be shared.

[8] http://www.nwcouncil.org/library/1983/PowerPlan.htm, p.1-3.

Recognizing It Needs to be Learned

Industry newcomers also struggle with what critical information is needed to be known. This is because it's difficult to identify what you need to learn, when you either don't know it is there to be learned or recognize you need to know it. It is often not until someone stumbles upon a question they can't answer or an issue they were not previously aware of that they recognize another gap in their industry knowledge.

New entrants in the EE field sometimes fail to realize that there is a need to know the lessons from earlier experience to be prepared for the future or have an appetite to learn it. In the Northwest, a flood of inexperienced new staff enthusiastically took the lead on complex EE research and implementation projects which resulted in difficulties in the management that could have been avoided had they been aware the lessons learned from prior program experience. Without historical insight and support, newcomers are repeating the mistakes of the generation before them. It is our hope that papers like this one that document the multiple lessons from a decades of experience with a single aspect of energy efficiency – specifically the boom and bust cycles – will alert the future analysts of how much they don't know. That is the first step to learning.

How Will It Be Done?

A wealth of knowledge is available in evaluation reports, studies and research papers, decision documents, and meeting minutes, yet today's up-and-comers lack the time and the patience needed to comb through thousands of pages of documented data. In addition, while much of this information can be found on bookshelves and hard-drives, much of the most important pieces of information are not available in electronic format, but lives in the minds of those who experienced it first-hand and in old, paper files. In order to pass on the knowledge, we must invent new, creative and effective methods to transfer these vast amounts of knowledge and experience to a generation that "types with their thumbs."

In the Pacific Northwest, a small group of efficiency staff, consisting of both new "geeks" and well-seasoned "geezers", have begun brainstorming ideas for this knowledge transfer. One concept put forward has been to take advantage of websites like YouTube, to create a set of short videos, focusing on key topics. The videos would be interviews of industry experts, briefly explaining the key concepts and informing new entrants of critical information needed to excel in efficiency field. In order to make this a successful project, however, there are a few critical obstacles to overcome. First, you have to know what topics will be of importance and interest. What is important to understand now may not be in five years, depending on where EE currently falls in the boom and bust cycle. For those new to the industry, how do you know what questions to ask?

A second possibility is to hold efficiency forums, where experts sit down together and discuss topics of their choice in front of live audiences. These "fire-side chats" can be informal and include a question and answer session where new industry entrants can interact with the presenters. It is likely these forums could only be offered a limited number of times, but could be recorded and posted online for others to view.

A third concept being discussed is to hold efficiency retreats. These retreats could be offered for half or whole days, where experts and new entrants could gather with a structured

agenda to discuss issues, ask questions, and listen to what experts consider to be the most important information to pass on.

There is a need to digitize many older research documents in the field, just as it has been necessary in other fields. Scanning long documents into PDF formats is tedious, but for many of our newer colleagues, the only place to find information is on the Web.

While all of these ideas have their pros and cons, this industry must figure out quickly how to proceed with passing on this information, as each day that goes by, our industry loses another link to the past which holds critical information to the success of this industry into the future.

Conclusion

After seeing the pattern of the boom and bust cycles of efficiency, and learning the negative impacts it has to costs and risk, it would be assumed that the efficiency industry has learned its lesson and would not allow the cycles to continue. Yet today, many utilities in the country, when facing low market prices, no load growth, and rate-pressure from customers could be looking to cut budgets and ramp down programs. While those who have experienced this in the past have the knowledge to defend sustained investment in EE, newcomers to the industry are not equipped with the tools needed to provide the key arguments to management. Energy efficiency "geeks" are being faced for the first time in their short careers, with the threat of repeating the energy efficiency cycle. We must understand that to not pass on the knowledge and lessons learned by the previous generation is a lost opportunity, and worth the time to invest in ways of passing on this critical information. If newcomers are able to quickly absorb the information of a generation before it, it may be possible to create an industry of sustained investment and stable careers for years to come.

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