

Lawrence Berkeley National Laboratory

LBL Publications

Title

National Mandates Won't Save Us!: How to Design Energy Efficiency Policies that Address Institutional Barriers to Change

Permalink

<https://escholarship.org/uc/item/5vb8g6hf>

Authors

Morabito, Molly

Wang, liyang

Payne, Christopher

et al.

Publication Date

2020-10-20

DOI

10.20357/b71s4q

Peer reviewed



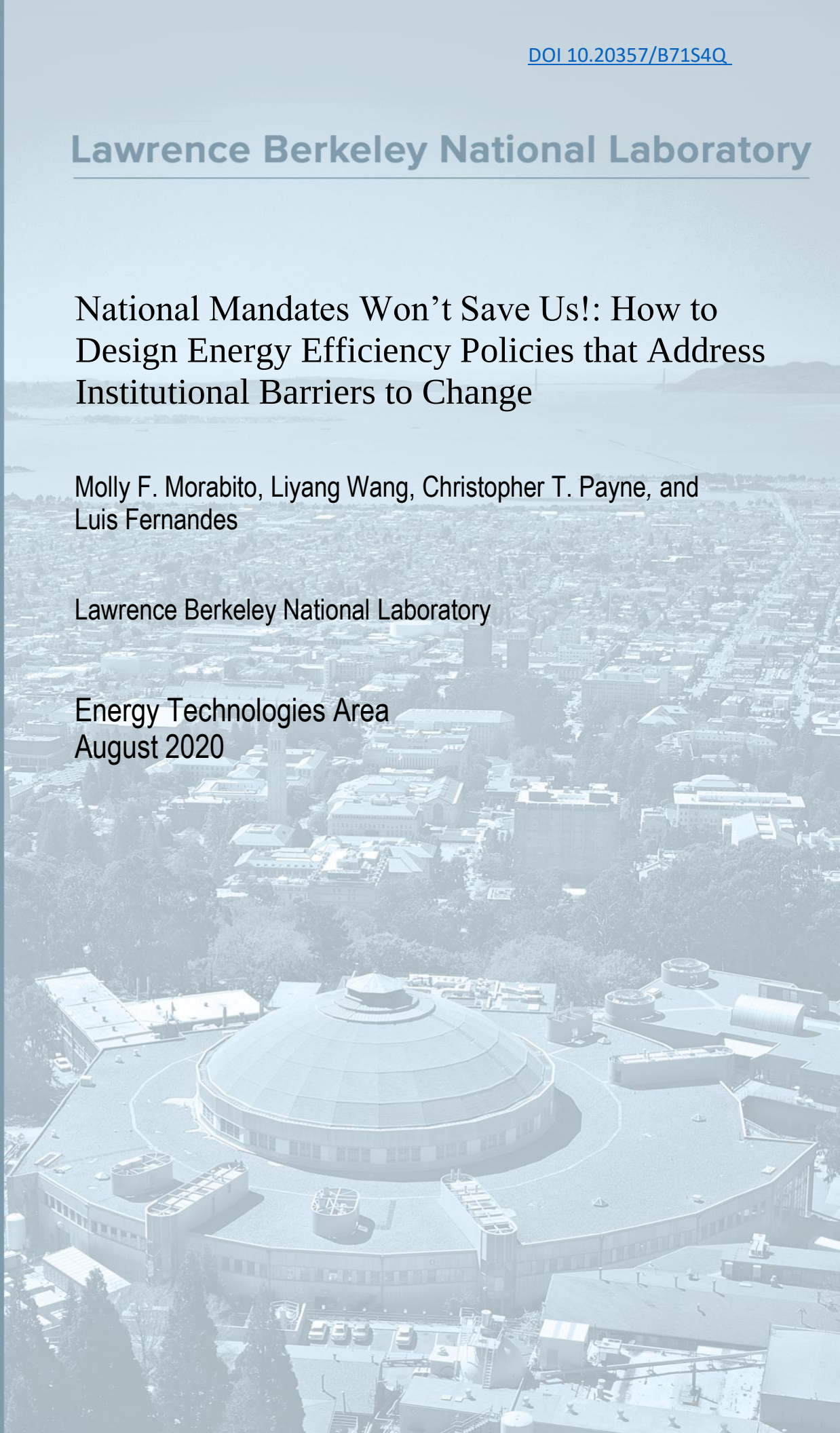
Lawrence Berkeley National Laboratory

National Mandates Won't Save Us!: How to Design Energy Efficiency Policies that Address Institutional Barriers to Change

Molly F. Morabito, Liyang Wang, Christopher T. Payne, and Luis Fernandes

Lawrence Berkeley National Laboratory

Energy Technologies Area
August 2020



Disclaimer:

This document was prepared as an account of work sponsored by the United States Government. While this document is believed to contain correct information, neither the United States Government nor any agency thereof, nor the Regents of the University of California, nor any of their employees, makes any warranty, express or implied, or assumes any legal responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights. Reference herein to any specific commercial product, process, or service by its trade name, trademark, manufacturer, or otherwise, does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency thereof, or the Regents of the University of California. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States Government or any agency thereof or the Regents of the University of California.

Acknowledgments:

This work was supported by the Assistant Secretary for Energy Efficiency and Renewable Energy, Federal Energy Management Program, of the U.S. Department of Energy under Contract No. DE-AC02-05CH11231.

National Mandates Won't Save Us!: How to Design Energy Efficiency Policies that Address Institutional Barriers to Change

Molly F. Morabito, *Lawrence Berkeley National Laboratory*

Liyang Wang, *Lawrence Berkeley National Laboratory*

Christopher T. Payne, *Lawrence Berkeley National Laboratory*

Luis Fernandes, *Lawrence Berkeley National Laboratory*

ABSTRACT

There are many national policies aimed at driving an increase in energy efficiency (EE) implementation. But how effective are they? Over the past 20 years, the U.S. government has established five legal authorities mandating federal agencies to prioritize energy-efficient products when purchasing. As the largest single buyer of energy-consuming products, energy-efficient purchasing across the federal sector would result in huge energy savings and emissions reductions. Despite this, our research has found that only ~55% of federal purchases currently meet existing requirements. If national mandates are not enough to ensure that federal agencies are buying efficient products, what is? To answer this question, we surveyed 161 procurement and sustainability staff from 26 different federal agencies. Findings revealed that several institutional factors (i.e., the roles, rules, and tools within an organization) play a key role in determining how likely federal buyers are to prioritize EE. Ensuring that federal agencies comply with existing EE requirements is foundational to achieving a clean energy future. This will require more than national mandates, but also the design of policies that successfully identify and address the institutional factors that must be changed in order to increase EE implementation. This paper presents an overview of the data collection and analysis methods for our study, as well as key survey findings and the insights they offer for overcoming institutional barriers to compliance with existing EE requirements. We conclude by discussing how these strategies can be broadly applied to improve the design of EE policies in the U.S. and beyond.

Keywords: *energy-efficiency; federal procurement; federal agencies; institutional barriers*

Introduction

Federal agencies are required to purchase energy-efficient products to minimize energy use in the federal sector, save the federal government money, and spur the market development of energy-efficient products. The national requirement for energy efficiency in federal procurement applies both directly to purchases by federal buyers and indirectly to vendors providing or maintaining products on behalf of the government. However, despite the clear policy directive to purchase energy-efficient products, a five-year review of federal solicitations data (i.e., contract documents and requests for proposals) show that federal buyers only request energy-efficient products about 55% of the time (Payne and Wang, 2018)). Furthermore, the solicitations review showed substantial variation in compliance both across agencies and among offices within the same agencies. These differences suggest that institutional structures and decision-making processes within each organization may influence how federal agencies or

offices purchase energy-efficient products. The ‘Roles, Rules and Tools’ framework (Department of Energy, 2017) helps describe the various institutional factors that may influence organizational outcomes: organizational hierarchy and corresponding responsibilities of individuals (Roles); formal practices and procedures, as well as informal ways of business (Rules); and the systems and resources in place to support the work (Tools). These Roles, Rules, and Tools within an organization influence a variety of internal processes, including how purchasing decisions are made and the extent to which energy efficiency considerations are prioritized and incorporated. Understanding how these factors impact the consideration of energy efficiency during purchasing can help us develop more effective interventions to increase the number of energy-efficient products adopted by the federal government.

To conduct this research, a team of researchers at the Lawrence Berkeley National Laboratory surveyed 161 federal employees involved in procurement from across 26 different agencies. Respondents were polled on the main Roles, Rules, and Tools that impact procurement at their respective agency, how commitment to energy efficiency was expressed within their agency, and the extent to which energy efficiency requirements were considered during purchasing. Results from the survey identified several factors that might limit or prevent agencies from prioritizing energy efficiency during the purchasing process. As such, we were able to recommend several interventions to help address those barriers.

While this study focuses on federal procurement, the Roles, Rules and Tools framework for identifying institutional barriers and the types of interventions we recommend for overcoming them are applicable to a variety of organizational types (e.g., higher education, local government, large corporations, etc.). This paper begins by reviewing existing literature on energy-efficient procurement and institutional barriers; it then discusses the methods of survey design, data collection, and analysis; and finally, it provides an overview of key findings from the survey and what implications they have for designing policies to promote energy-efficiency among large organizations that better address institutional barriers.

Literature Review

The U.S. federal government represents the largest single buyer of energy-consuming products in the world, purchasing up to \$10 billion worth of lighting, PCs, heating/cooling systems and more every year (Chalasani and Payne, Forthcoming). By directing this large purchasing power towards the adoption of energy-efficient products, federal procurement can help significantly reduce the amount of energy consumed by the federal sector, resulting in reduced carbon emissions and increased cost savings across the U.S. government. Additionally, increased federal procurement of energy-efficient products creates higher demand for the manufacturing of energy-efficient products, which can potentially reduce initial cost for other consumers.

The movement towards energy efficiency in the federal sector began with the Oil Embargo of 1972, which sparked the National Energy Conservation Policy Act aiming to reduce U.S. dependence on imported fossil fuels. Since then, there have been many policies enacted to make energy efficiency a greater priority for the federal sector, including the creation of five legal authorities mandating that federal agencies prioritize energy-efficient products during

purchasing. These authorities include the Energy Policy Act of 2005, the Energy Security and Independence Act of 2007, the Federal Acquisition Regulation Part 23.2, Executive Order (E.O) 13834: Efficient Federal Operations, and E.O. 13221: Energy-Efficient Standby Power Devices. The Federal Acquisition Regulations (FAR) clause sets rules for all procurements and contracting within the federal government. These policies require federal agencies to “give purchasing preference to products that are certified by ENERGY STAR or designated by FEMP as energy efficient products¹” (42 U.S.C. § 8259b, 10 CFR part 436, subpart C). The U.S. Department of Energy’s Federal Energy Management Program (FEMP) is tasked with overseeing federal energy-efficient product procurement (EEPP) and providing guidance and resources on how to meet existing requirements.

In support of FEMP’s work to oversee the federal purchasing of energy efficient products, researchers at the Lawrence Berkeley National Laboratory (LBNL) have reviewed five years of solicitations from the federal government to determine how well federal agencies are complying with the requirements outlined by these five legal authorities. This research shows that compliance with energy-efficiency requirements for purchasing across the federal sector is approximately 55% (Payne and Wang, 2018). Full compliance with the energy-efficiency requirements currently in place could have resulted in an additional energy cost savings of \$195 million in FY2018 alone (Chalasani and Payne, Forthcoming). Over the last twenty years, the federal government is estimated to have forgone a total of \$4.8 billion in energy cost savings over the last twenty years as a result of not being fully compliant with existing requirements (Chalasani and Payne, Forthcoming). Full compliance with energy efficiency requirements also represents future savings of up to \$500 million and 3.5 million tons of CO₂eq per year (Chalasani and Payne, Forthcoming). This research indicates a clear incentive to increase the purchasing of energy-efficient products in the federal government. However, while it is possible to track the amount of energy-consuming products purchased each year, and the number of solicitations that include the correct energy-efficiency requirements, this data does little to explain how or why federal agencies make decisions about how to prioritize energy-efficient products and when to include energy efficiency requirements during the purchasing process.

LBNL’s review of federal solicitations did reveal considerable variance in compliance rates across different federal agencies, as well as variance within the same agency across different offices. This suggests institutional factors -- i.e., the Roles, Rules and Tools within a given organization -- may play a role in determining how likely an office is to prioritize or include energy efficiency requirements during purchasing. Understanding these internal factors can thus reveal new opportunities for designing interventions that lead to greater overall prioritization of energy efficiency. Since the 1990s, a wide range of literature has focused on identifying and classifying the main barriers to implementing sustainability measures in organizations (Post and Altman, 1994; Hillary, 2004; Chan, 2008; Shi et al., 2008, among others). According to Hodgson (2006), an ‘organization’ is composed of institutional structures that delineate the responsibility of its people, govern internal processes and interactions, and determine the use of specific resources. Together, these institutional structures determine certain outcomes and influence behavior, such as organizational decision-making around what to buy.

¹ ‘Energy-efficient product’ is defined by the FAR clause as “a product that (i) meets Department of Energy and Environmental Protection Agency criteria for the use of the ENERGY STAR trademark label; or (ii) is in the upper 25 percent of efficiency for all similar products as designated by the Department of Energy’s Federal Energy Management Program.”

The institutional theory (Dimaggio and Powell 1983; Lawrence and Shadnam 2008) lens provides a useful tool in understanding how these factors impact sustainable procurement (and conversely, act as barriers to it). Husted and Allen (2006) survey-based study indicated the importance of institutional pressures in driving decisions about sustainable procurement. Some scholars (Blumstein et al. 1980; Jaffe et al. 2003; DeCanio 1998; Painuly and Fenhann 2002; Margolis and Zuboy, 2006; Sorrell et al., 2011; Timilsina et al. 2016) posit a range of institutional barriers that may limit sustainable energy technology adoption through purchasing. For the purposes of this paper, ‘institutional barriers’ can be understood as organizational factors that limit or hinder certain behavior and/or processes within an organization (such as the decision to include energy efficiency requirements or otherwise prioritize energy efficiency when purchasing goods and services).

Several examples of institutional barriers have been identified by existing literature in the context of energy-efficient technology adoption. Painuly and Fenhann (2002) found that large organizations are sometimes prevented from adopting sustainable energy technologies (including energy-efficient products) because they lack the time and resources to learn about new technologies. Additionally, lack of awareness or inadequate information about existing options can also pose a barrier to the adoption of energy-efficient technologies (Mirza et al., 2009). This lack of information can also lead to the low prioritization of energy efficiency (Soepardi and Thollander, 2018), as the importance or benefits of adopting energy-efficient technologies is not widely expressed or communicated to stakeholders within an organization. Lack of information, various institutional rules, and finite resources can constrain decision-making behavior, prompting individuals within an organization to seek the easiest optimal solution (Simon 1972; Cooremans 2009). In the context of procurement, these constraints on decision-making often lead organizations to prioritize lowest first cost, since that is a much easier attribute to identify and compare across products and services than other attributes that may more readily lead to the selection of an energy-efficient product (e.g., lowest life cycle cost). Such emphasis on lowest first cost, as well as the general risk-aversion exhibited in institutional procurement (Adetunji et al., 2008), may lead organizational decision-makers to place a higher priority on initial cost savings and a lower priority on energy-efficient technologies when deciding what products to buy (Hasanbeigi et al., 2010). These studies offer some evidence of the internal institutional factors that may explain why federal agencies do not fully comply with existing energy efficiency requirements during purchasing, despite federal mandates.²

However, while there is a relatively small body of research that focuses on institutional barriers to the adoption of energy-efficient technologies, a majority of the literature on barriers to energy-efficient technology adoption centers on market barriers (Howarth and Andersson, 1993; Golove and Eto, 1996; Weber, 1997; Brown 2001; Brunke et al. 2015). Additionally, most of these studies have focused on barriers to energy-efficient technology adoption among individual or residential consumers, with less of a focus on large organizational buying behavior (Drumwright, 1994), despite the significant energy savings and emissions reduction that could be achieved by leveraging institutional procurement to increase the uptake of energy-efficient technologies. Our research aims to provide greater understanding of organizational buyer

² These mandates require the prioritization of products that meet the Department of Energy and Environmental Protection Agency criteria for use of the Energy Star trademark label; or is in the upper 25 percent of efficiency for all similar products as designated by the Department of Energy’s Federal Energy Management Program.

behavior and identify the institutional barriers that may be preventing federal agencies from purchasing more energy-efficient products, despite a clear policy directive to do so.

Methods

Administering the survey consisted of three rounds. First, a pilot phase consisting of five phone interviews was conducted to test possible survey questions with different respondent types. Second, a broader survey was deployed online with an additional second subset of phone interviews. Finally, in-depth follow-up interviews were scheduled with survey respondents to expand on their answers and further discuss survey findings.

Research Design

Insights from institutional change and procurement pathways literature helped inform the design of this survey. The survey was organized according to the "Roles, Rules, and Tools" framework. The questions in the first section focused on the roles and responsibilities related to procurement within a respondent's organization, which were meant to reveal the general attitude towards energy-efficiency within each agency and the types of roles that had the most significant influence over the procurement process. The second section focused on understanding the procurement practices and procedures within the respondent's agency, and provide more insights on procurement priorities at different organizations and how commitment to energy efficiency is communicated and evaluated within each agency. Finally, the third section of the survey aimed at identifying the types of tools used by an office or agency during procurement. Based on insights from the pilot phase interviews, some questions were altered or modified for the broader survey.

The Human Subjects Committee (HSC), which comprises the Institutional Review Board at LBNL, conducted a review of the questions and outreach material used to ensure proper language and practice used in this survey.

Recruitment

While the central focus of this research was on procurement officers in the U.S. federal government, some additional actors also influence the procurement process and who have an impact on compliance with EEP requirements. The population boundary for this survey was thus determined to include the entire federal procurement community, which is any federal employee involved during the procurement process. For the purposes of this study, and based on previous research in federal procurement conducted by LBNL, we categorized these employees into two main groups: "*procurement officers*" and "*specifiers*." Based on the sampling frame, we first conducted outreach to procurement officers who contracted for both covered products and non-covered products in the past 10 years. We sent about 12,000 direct emails to federal personnel listed on the online platform.³ Then we targeted procurement officers not listed on FBO and the specifiers. To reach these contacts, we advertised the survey at federal procurement association meetings and mailing lists. We also wanted to reach other federal personnel who are

³ Federal Business Opportunities ([FBO.gov](https://www.fbo.gov)) is an online database where federal buyers post solicitations for product and service contracts for any purchases exceeding \$25,000. This public data was transferred to SAM.gov as of late 2019, after the survey had concluded.

not directly involved in procurement but still influenced the purchasing process related to energy efficiency (e.g. setting budgets, or implementing sustainability initiatives at a given agency). In total, 8,350 federal personnel were contacted directly by the research team, and an estimated 50 more were reached by indirect means for an overall sum of ~8,400. Of those reached, 161 self-selected respondents completed the survey for an overall response rate of 1.9%.

Data Collection

The survey was deployed online using SurveyMonkey, with the option of receiving a paper survey if preferred. Outreach efforts commenced in May 2019 and were discontinued in August 2019, when we had reached 161 responses. To analyze the preliminary survey data discussed in this report, the research team first reviewed raw data from each question in SurveyMonkey and Excel. Among those that completed the survey, 34 respondents indicated that they would be willing to participate in follow-up interviews. 11 interviews were conducted over the course of two months (December 2019 to January 2020). Interviews were recorded, anonymized, and transcribed. These transcripts then underwent three rounds of coding for thematic analysis.

Limitations

This is one of the first surveys of federal procurement staff focused on energy-efficient product procurement, which meant we did not have much previous data to examine. As a result, a few limitations qualify the results of this study. The first is posed by incomplete outreach efforts. Due to project constraints, we were only able to complete the first wave of outreach -- focused on federal contracting officers listed on FBO -- and therefore a majority of survey respondents are in this role. While this provides useful information about how federal contracting officers perceive energy-efficiency purchasing requirements, the self-selected sample would have benefitted from including greater representation from other target groups. Several other roles play an important part in the procurement process as it relates to energy-efficient purchasing besides contracting officers (e.g., program managers, sustainability managers, facilities managers, etc.). For example, about half of the survey respondents indicated "Project manager" or "Program manager" are one of the top three roles primarily responsible for ensuring contract compliance with energy efficiency requirements. However, currently, less than 10% of survey respondents were identified as having those roles. Future study would benefit from expanding recruitment into other roles involved in the procurement process in order to obtain a more comprehensive and inclusive perspective of the federal procurement community.

A second limitation was posed by the fact that, while the survey received responses representing 26 different federal agencies, about half of respondents are from three agencies: Department of the Army, the General Services Administration (GSA), and the U.S. Department of Agriculture (USDA). In total, we received a disproportionately higher number of respondents from agencies outside the Department of Defense (DoD) than from DoD agencies due to self-selection bias. This bias might have impacted the survey findings. However, the effort and logistics required in developing a more representative sample were unfortunately not within the resources available for this project. Future study could benefit from having greater representation from procurement staff within underrepresented agencies, as they constitute a significant portion of the government's total procurement activity.

Results

The survey received a total of 161 responses from respondents representing 26 different federal agencies and 45 different job titles. As Table 1 shows, about half of respondents are from three agencies: Department of the Army, General Services Administration (GSA), and U.S. Department of Agriculture (USDA). Over half of the survey respondents are either contracting officers or contract specialists, followed by respondents with facility/energy/engineer roles. The rest is fragmented among about 50 different job titles (Figure 1).

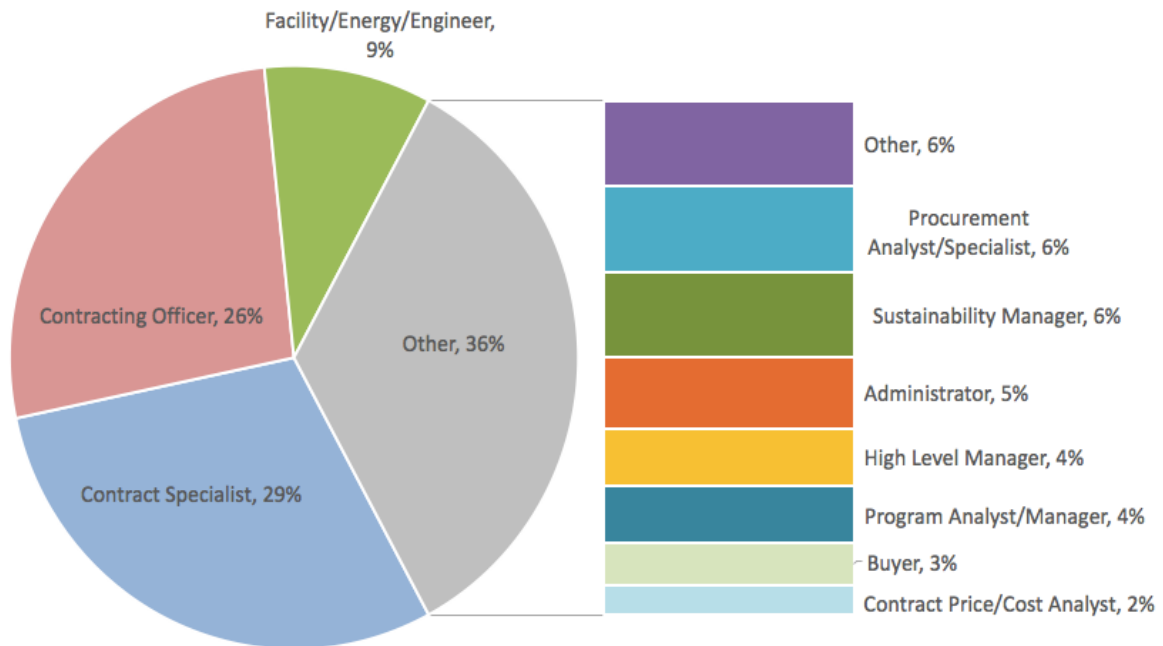


Figure 1. Distribution of the respondent's job title.

Institutional barriers to energy-efficient purchasing

Survey questions focused on understanding the processes and internal factors that influence how purchasing decisions are made within federal agencies and to what extent energy efficiency is prioritized or considered. By assessing the Roles, Rules, and Tools, the survey revealed some potential institutional barriers that may be impeding or restricting the number of energy-efficient purchases carried out by federal agencies. Each institutional barrier represents a misaligned Role, Rule, and/or Tool. These included: low prioritization of energy efficiency attributes when selecting products and services to purchase, commitment to energy efficiency not widely communicated within the organization, lack of training on how to meet energy efficiency requirements during purchasing, lack of feedback on whether agencies were purchasing energy efficient technologies, and lack of default-setting in existing procurement tools to automatically include energy-efficiency requirements.

Energy efficiency not a top priority for purchasing

In order to assess where energy-efficiency ranks as a priority during procurement, respondents were asked to rank procurement objectives for their respective agencies in order of highest

priority to lowest priority. Over 50% of the respondents selected ‘lowest purchase cost’ as the highest priority, followed by utilizing ‘small businesses’ (Figure 2).

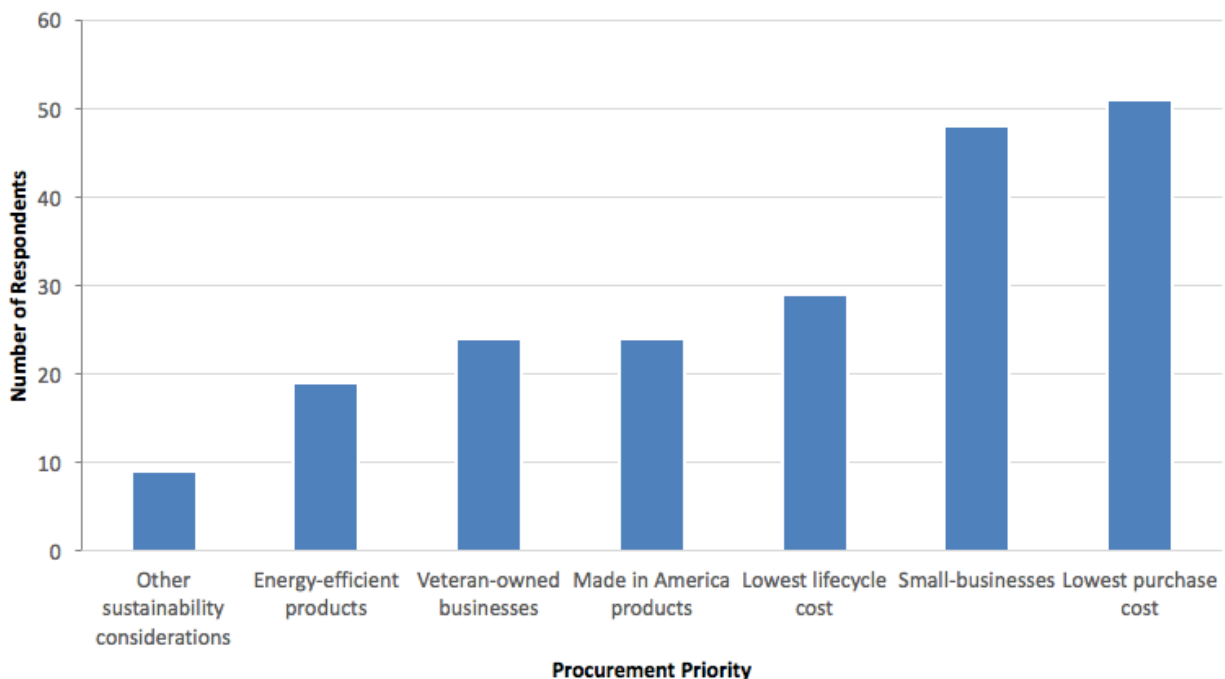


Figure 2. Highest priorities for procurement reported by respondents.

Respondents noted in follow up interviews that lowest first cost was often prioritized over life cycle cost and other attributes because it was easier to calculate and provided easy justification when trying to get approval for purchases. However, as one respondent noted in follow up interviews, “*there would definitely be a difference [in procurement priority] based on what we’re buying.*” In other words, priorities could shift slightly based on the product category. Respondents also noted that prioritization of energy efficiency was often determined by those in top-level positions on a given project. As one respondent noted, “*Procurement [officers] can’t be the one telling people, no, you’ve got to prioritize energy efficiency. It’s not procurement’s role to do that. Someone higher up has to decide that energy efficiency is something we’ve got to do and then it flows down to the appropriate people.*” The importance of top-level buy-in was further evidenced when survey respondents were asked to indicate what would make them or their colleagues more likely to consider energy efficiency requirements when purchasing. A majority of respondents (72%) selected ‘Energy efficiency expressed as greater priority by leadership’.

This provides evidence that buy-in from top management is important for energy-efficient contracting, and suggests that energy efficiency may not currently be expressed as a top priority by leadership within federal agencies.

Commitment to meeting energy efficiency requirements not widely communicated

Survey respondents were also asked to indicate how the commitment to meeting energy efficiency requirements for purchasing was expressed within their respective agency. The top three communication formats selected by the most respondents were ‘Memos’, ‘Workshops/seminars’, and ‘Internal meetings’. About 25% of the respondents indicated commitment to energy efficiency requirements is not communicated at all. As one respondent

further elaborated: *'I'm a former Contract Specialist and COR [Contracting Officer's Representative]. Energy efficiency was rarely communicated to me in any of my roles. Only recall seeing it on a purchase checklist and in yearly bankcard training.'* These findings indicate that additional forms of communicating the importance of energy efficiency in contracting might be needed within federal agencies. Evidence that commitment to energy efficiency is not widely communicated within federal agencies was further evidenced when respondents were asked whether guidance on how to meet energy efficiency contracting requirements was included during the training process within their agency. A majority of respondents (65%) indicated that they had not received such guidance or training. Of those that indicated they had received guidance on how to meet energy efficiency contracting requirements during the training process, several wrote that this guidance had been conveyed during an 'Annual training' or had attended an 'Annual contracting meeting.' One respondent referenced a course on 'sustainable procurement' included in the Federal Acquisition Certification for Contracting Officer's Representatives (FAR-COR) program, which provides information on how to procure ENERGY STAR and FEMP-designated products. When describing the training that had been received at their agency, one respondent noted that it contained *'minimal kind of references to energy efficiency'* and *'it's just so minimal and it's not ongoing ... so I don't know how helpful it is for people'*.

Lack of sufficient tools to track and make energy-efficient purchases

Respondents were asked if they currently have a tool in place that helps track energy-efficient purchases at their agency. 77% of respondents indicated 'No.' These findings suggest that federal agencies are not currently using tools to effectively track energy efficient purchases. Tracking these purchases could be important to increasing compliance rates, as this provides feedback on current performance of an agency. Respondents were also asked to indicate what kinds of feedback they received for evaluating compliance with energy efficiency requirements, and to what extent that feedback was helpful (i.e., supports the continuation or increase of energy-efficient purchasing). Over 60% of respondents reported that they do not receive any type of feedback that enables them to evaluate compliance with energy-efficiency requirements for purchasing (Figure 3).

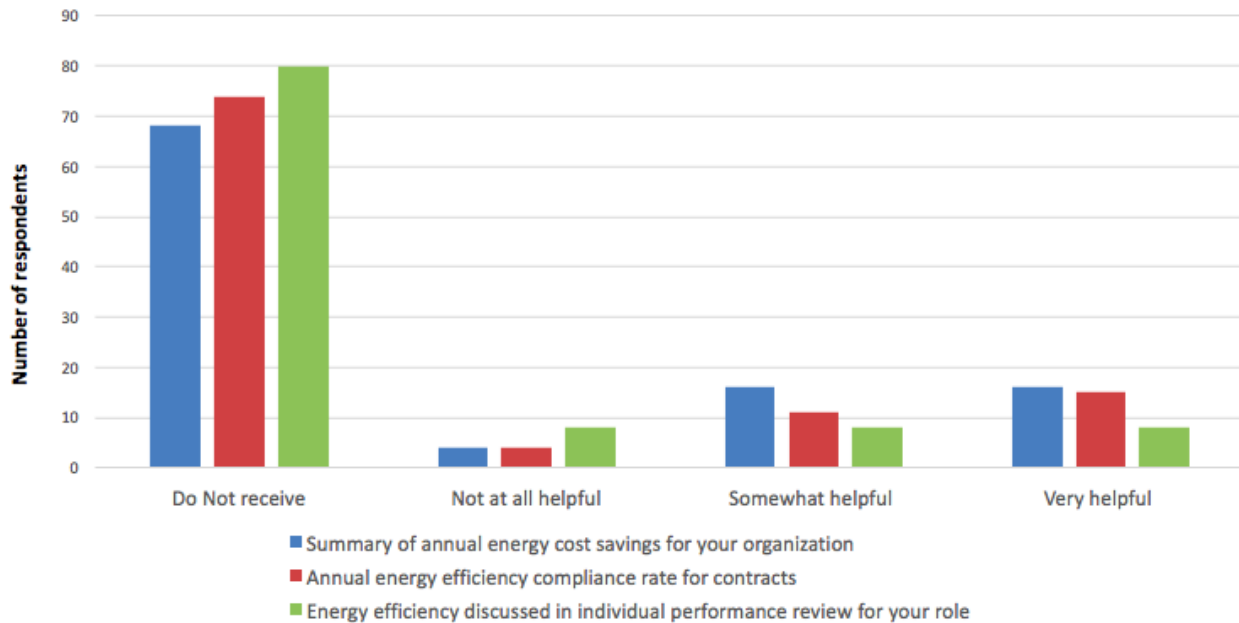


Figure 3. Most respondents do not receive feedback for evaluating compliance with energy efficiency requirements.

In a write-in question, several respondents (14% out of the 87 who answered) indicated that more feedback on current agency efforts to meet energy efficiency requirements would help encourage greater compliance with requirements, as well as integrating energy efficiency into existing evaluation methods. One respondent noted, *‘I’d like to see by agency/sub-agency compliance levels, to include those for post/camp/station,’* while another wrote *‘A scoreboard, prominently displayed, would alert everyone how we perform in relation to historic figures and the goal...’* In terms of adding energy efficiency considerations to performance evaluations, respondents wrote: *‘include energy efficiency in [sic] evaluation process,’* and *‘Performance evaluation plans should include energy efficiency targets for site energy use.’* Additionally, while most respondents reported using standard procurement tools (e.g., standardized specification templates, e-procurement systems, and purchase order requisition forms) at their agencies, when asked whether the tool they currently use automatically prompts them to include energy efficiency (e.g., when writing a contract), a majority (70%) indicated ‘No’. This data suggest that most procurement tools used by procurement personnel at federal agencies are not set to automatically include energy efficiency in contract documents or as an evaluative measure. Including requisite clauses to ensure the product requested from a vendor is energy efficient thus requires an extra step, which procurement personnel may be less likely to take.

Opportunities for increasing energy-efficient purchasing

In addition to providing evidence of different institutional barriers acting to slow or hinder the purchasing of energy-efficient technologies, survey responses also yielded insights into areas where interventions could be targeted to help increase the prioritization of energy efficiency among federal agencies. When asked to provide information about what additional tools or resources would be effective in increasing energy-efficient purchasing throughout one’s office or agency, respondent write-in responses fell into six main categories: improved tools (15%), better feedback and evaluation (13%), education and awareness (8%), stronger policy directives (7%),

strategic stakeholder engagement (7%), and training (7%). Follow up interviews also revealed further insights into how these interventions could be applied to help increase the prioritization of energy efficiency within agency offices. In terms of improved tools, one respondent asked that energy efficient product listings be incorporated into existing agency tools rather than requiring a separate search. One respondent noted, *‘[A] website with dashboard-type metrics that show the positive impact of seeking energy-efficiency [would be effective]; it should capture cost savings, time savings, and environmental footprint savings.’* Another said they would like to see their agency use *‘a centralized purchasing system where ... you had to go through this portal that had energy efficient products as the focus ...’* Others suggested templated contracts or product specifications, tools for tracking energy efficiency purchases within an office or agency, evaluation tools that incorporate energy efficiency compliance rates, and tools that provide energy efficiency requirements in a way that could be easily integrated into a central compliance document for LEED new construction or O&M (operations & maintenance). Respondents also noted that more official guidance and training on how to clearly identify energy-efficient products was necessary. Some suggested a need for agency leadership to address energy efficiency more directly and to demonstrate a stronger directive from top management. As one respondent noted, *“All our procurements start ... on the program side. I mean, they’re the ones that are really defining what they need. So [we need to] kind of train the program managers on why energy efficiency is important and how to do a better job specifying those products or services.”* Others suggested that additional requirements (e.g., required fill-in fields on existing contracting tools, mandatory online platforms, requiring the sharing of compliance rates) be created to further incentivize energy efficiency purchasing.

Discussion

Right now, federal agencies request energy-efficient products from vendors about 55% of the time. Previous research has shown us that the federal government can save up to \$186 million per year if federal agencies fully complied with energy efficiency requirements during purchasing. Based on LBNL’s five-year review of federal solicitations it is clear that a variety of federal agencies are buying energy-consuming products, and that their compliance with energy efficiency requirements varies from one agency to another, and within an agency, from one office to the next. This tells us that organizational context plays a role in determining how likely an office is to prioritize energy efficiency during purchasing. By reaching out to staff at federal agencies, we were able to identify a few organizational factors that might limit or prevent agencies from better incorporating energy efficiency into their purchasing decisions. Based on the survey, we can recommend the following interventions to help address these barriers:

Provide more salient training. Survey and interview responses indicate a clear need for more training and guidance on how to meet energy efficiency requirements. 60% of respondents indicated more training targeted at energy efficiency contracting would make a difference in whether or not to consider energy efficiency when purchasing. Additionally, analysis showed that agencies that received training were also likely to have additional practices and rules in place to encourage energy-efficient product purchasing, beyond the national mandates. Over 50% of the respondents' agency that receives training indicated they also have additional rules and practices in place to encourage purchasing energy-efficient products, while only 19% of the respondents' agency that did not receive training indicated they have additional rules and

practice. Most respondents wrote that training should be ‘hands-on’ or in-person at their respective agencies and offices, rather than online via webinar. Some respondents wrote that training should provide scenarios or examples specific to energy efficiency requirements during contracting. Respondents also wrote that training should provide the ‘why’ – i.e., they should explain the justification behind buying energy efficient products, and why it should be a priority for people in their role. Others suggested that the training one received should be customized to their specific role within the agency. This would require customizing the justification provided for energy efficiency based on the role of the person being trained. For example, facilities managers might receive a training on the technological benefits of switching to new energy-efficient products; energy managers might learn more about how procurement could be leveraged to achieve energy savings within their agency; and program managers might be trained on the lifetime cost savings that could be obtained by prioritizing more energy-efficient products.

Improve existing tools to help track and evaluate energy-efficient contracts. Existing procurement tools do not typically automatically include the energy efficiency requirement in contracting. Setting up tools to automatically include or select the relevant FAR Clause for energy efficiency (52.223-15) would be an easy way to increase the number of compliant contracts in the federal sector. Additionally, online procurement platforms could be set up so that energy-efficient products appear first in a search or are automatically set as the ‘default’ option, making it easier for procurement officers to quickly identify and select them for purchase. Finally, survey findings suggest that federal agencies do not currently have tools in place to track energy-efficient purchases. Tools for tracking the number of compliant contracts posted each year (perhaps cross-referenced with the number of energy-efficient products actually *received* from vendors) is also critical to assessing aggregate and individual organization performance.

Ensure that commitment to energy efficiency is communicated by top-level management. About 25% of respondents indicated a commitment to energy efficiency requirement is not currently communicated within their agency. 32% reported that they did not find the communications they had received very effective in reinforcing the commitment to meeting energy efficiency requirements. Furthermore, when asked what would make them or their colleagues more likely to consider energy efficiency during purchasing, a majority of respondents selected ‘Energy efficiency expressed as a greater priority by leadership.’ This provides evidence that buy-in from top management is important for energy-efficient contracting, and suggests that currently energy efficiency may not be sufficiently expressed as a priority within federal agencies. Targeting messages to resonate more directly with individuals in top-level management roles (e.g., framing energy efficiency in unison with other procurement priorities, such as cost savings and meeting small-business requirements) could encourage agency leadership to make energy efficiency a higher priority. Additionally, as one respondent wrote, the directive to purchase for energy efficiency should be clearly communicated ‘*early on in the acquisition process, e.g. the planning stage.*’ Program leadership can play a key role in communicating the importance of energy efficiency and establishing it as a priority for projects within an organization from the beginning, to ensure that this is communicated throughout the implementation process.

Conclusion

There are many national policies aimed at driving an increase in energy efficiency implementation. The federal procurement community provides a clear example of how these national mandates are not always effective at increasing the prioritization of energy efficiency. Over the past 20 years, the U.S. government has established five legal authorities mandating federal agencies to prioritize energy-efficient products when purchasing. As the largest single buyer of energy-consuming products, energy-efficient purchasing would result in huge energy savings and emissions reductions. Despite this, our research has found that only ~55% of federal purchases currently meet existing requirements. These findings suggest that policy directives alone are not enough to ensure energy efficiency is made a top priority for federal agencies. Variance in compliance rates among federal agencies -- and even variance among offices within the *same* federal agency -- suggest that organizational context plays a role in how energy efficiency requirements are considered or prioritized during the purchasing process. By surveying members of the federal procurement community, we were able to gain insights into what organizational factors acted as institutional barriers to the greater prioritization of energy efficiency during the procurement process, as well as identify possible interventions that could overcome these barriers. While this research was applied within the context of federal procurement, which offers considerable opportunities for energy savings and emission reductions, the Roles, Rules and Tools framework for understanding organizational context and identifying institutional barriers can be applied in a variety of settings. Understanding these institutional barriers and the effect of internal organizational factors on energy efficiency initiatives is key to developing more successful interventions to promote the adoption of energy-efficient technologies in the coming decades.

References

- Adetunji, I. O., Price, A. D., & Fleming, P. R. (2008). Achieving sustainability in the construction supply chain.
- Blumstein, C., Krieg, B., Schipper, L., & York, C. (1980). Overcoming social and institutional barriers to energy conservation, *Energy*, Volume 5, Issue 4, Pages 355-371.
- Brown, M. A. (2001). Market failures and barriers as a basis for clean energy policies. *Energy policy*, 29(14), 1197-1207.
- Brunke, J. C., Johansson, M., & Thollander, P. (2014). Empirical investigation of barriers and drivers to the adoption of energy conservation measures, energy management practices and energy services in the Swedish iron and steel industry. *Journal of Cleaner Production*, 84, 509-525.
- Cooremans, C. (2009). The role of formal capital budgeting analysis in corporate investment decision-making: a literature review.

- DeCanio, S. J. (1998). The efficiency paradox: bureaucratic and organizational barriers to profitable energy-saving investments. *Energy policy*, 26(5), 441-454.
- Department of Energy. (2017). *Institutional Change Process Step 2: Assess Institutional Rules, Roles, and Tools*. [online].
- DiMaggio, Paul J., and Walter W. Powell. "The iron cage revisited: Institutional isomorphism and collective rationality in organizational fields." *American sociological review* (1983): 147-160.
- Drumwright, Minette E. "Socially responsible organizational buying: environmental concern as a noneconomic buying criterion." *Journal of marketing* 58, no. 3 (1994): 1-19.
- Golove, W. H., & Eto, J. H. (1996). Market barriers to energy efficiency: a critical reappraisal of the rationale for public policies to promote energy efficiency (No. LBL-38059). Lawrence Berkeley Lab., CA (United States).
- Hasanbeigi, A., Menke, C., & Du Pont, P. (2010). Barriers to energy efficiency improvement and decision-making behavior in Thai industry. *Energy Efficiency*, 3(1), 33-52.
- Hillary, Ruth. "Environmental management systems and the smaller enterprise." *Journal of cleaner production* 12, no. 6 (2004): 561-569.
- Hodgson, G. M. (2004). *The evolution of institutional economics*. Routledge.
- Howarth, R. B., & Andersson, B. (1993). Market barriers to energy efficiency. *Energy Economics* 15(4), 262-272.
- Husted, Bryan W., and David B. Allen. "Corporate social responsibility in the multinational enterprise: Strategic and institutional approaches." *Journal of international business studies* 37, no. 6 (2006): 838-849.
- Jaffe, Adam B., Richard G. Newell, and Robert N. Stavins. "Technological change and the environment." In *Handbook of environmental economics*, vol. 1, pp. 461-516. Elsevier, 2003.
- Lawrence, Thomas B., and Masoud Shadnam. "Institutional theory." *The international encyclopedia of communication* (2008).
- Margolis, R., & Zuboy, J. (2006). Non Technical barriers to solar energy use: review of recent literature (No. NREL/TP-520-40116). National Renewable Energy Lab (NREL), Golden, CO (United States).

- Mirza, U. K., Ahmad, N., Harijan, K., & Majeed, T. (2009). Identifying and addressing barriers to renewable energy development in Pakistan. *Renewable and Sustainable Energy Reviews*, 13(4), 927-931.
- Painuly, J. P., & Fenhann, J. V. (2002). Implementation of renewable energy technologies- opportunities and barriers. Summary of country studies. Risø National Laboratory. UNEP Collaborating Centre on Energy and Environment.
- Post, James E., and Barbara W. Altma. "Managing the environmental change process: barriers and opportunities." *Journal of Organizational Change Management* (1994).
- Simon, H. A. (1972). Theories of bounded rationality. *Decision and organization*, 1(1), 161-176.
- Shi, Han, S. Z. Peng, Yu Liu, and Ping Zhong. "Barriers to the implementation of cleaner production in Chinese SMEs: government, industry and expert stakeholders' perspectives." *Journal of cleaner production* 16, no. 7 (2008): 842-852.
- Soepardi, Apriani, and Patrik Thollander. "Analysis of relationships among organizational barriers to energy efficiency improvement: A case study in Indonesia's steel industry." *Sustainability* 10, no. 1 (2018): 216.
- Sorrell, S. et al (2000), Reducing barriers to energy efficiency in public and private organizations. Brighton, UK: SPRU-Science and Technology Policy Research.
- Timilsina, G. R., Hochman, G., & Fedets, I. (2016). Understanding energy efficiency barriers in Ukraine: Insights from a survey of commercial and industrial firms. *Energy*, 106, 203-211.
- Thollander, P., and Ottosson, M. (2010), Energy management practices in Swedish energy intensive industries, *Journal of Cleaner Production*, 18, pp. 1125-1133.
- Wang, Liyang, and Christopher Payne. "Changing Institutional Procurement Behavior to Achieve Energy Savings." (2018).
- Weber, L. (1997). Some reflections on barriers to the efficient use of energy. *Energy Policy*, 25(10), 833-835.