Demonstrating Value and Overcoming Data Privacy Obstacles to Achieve Universal Benchmarking: Key Lessons Learned from California

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ABSTRACT

The passing of the Governor's Green Building Initiative (GBI) in 2004 and AB 1103 in 2007 moved California to the forefront of energy benchmarking in the United States. The GBI mandated use of benchmarking tools to track savings goals for State facilities, while AB 1103 expanded the scope to all non-residential buildings in California by requiring disclosure of benchmarking data for whole-building commercial financial transactions.

California policymakers, utilities, regulatory agencies, and commercial real estate representatives have collaborated over the past six years to write enabling regulations that would be feasible and fulfill the intent of the law. As technical and political challenges continued to delay AB 1103 implementation, however, other state and local governments nationwide were working in parallel to incorporate energy performance disclosure requirements into their own regulations. Many have been able to implement these requirements in a significantly reduced timeframe from that of California.

This paper will serve to update previous papers[1] by highlighting key remaining obstacles plaguing California's benchmarking progress, and its connection to challenges facing jurisdictions throughout the country. The focus will be on the central obstacles of customer confidentiality and the role of key stakeholders in understanding benchmarking's value and motivating its implementation. An explanation of how these challenges are affecting the future of benchmarking will provide honest insight for policymakers, utilities, building owners, and evaluators about the need for high level policy drivers, and a lot of persistence, in order to make universal benchmarking in California, and across the country, a reality.

Introduction

Benchmarking is a term used to describe the process of comparing the measured energy performance of a facility relative to other facilities, or itself, over time. Benchmarking metrics may include raw utility bill data, the U.S. Environmental Protection Agency's (EPA) 1-to-100 score, site or source energy use intensity (EUI), or equivalent greenhouse gas emissions. Typically benchmarks are adjusted or 'normalized' to allow comparison with other buildings and performance tracking over time. Such adjustments usually require information about physical influences such as building size, type, and weather. More advanced benchmarking systems might include operational influences, such as occupancy and hours of operation. AB 1103, and other benchmarking policy initiatives throughout the country, specifies the use of the EPA's ENERGY STAR Portfolio Manager tool, which compares the annual energy performance of a building to

[1] Barr, Amy, Douglas Mahone, Theda Silver-Pell, Tracy Narel, and Martha Brook. ACEEE Summer Study, 2010. "Benchmarking California's Buildings – Lessons Learned on the Road to Energy Use Disclosure".

peer buildings nationwide. Regardless of the tool, though, benchmarking always requires obtaining measured energy consumption for the entire building.

Benchmarking represents a powerful mechanism for encouraging building owners to improve building energy performance.[2] Although the action of benchmarking does not save energy by itself, the knowledge can be used to direct and inform energy efficient actions.[3,4] Not only could its widespread use lead to higher penetration of energy conservation and efficiency improvements in nonresidential buildings, but it also improves owner awareness of building performance by identifying poorly performing buildings, providing a baseline for measuring performance improvement, creating competition through comparison with like buildings, and enumerating trends in building performance over time.

Benchmarking continues to play an increasingly large role in California's energy efficiency strategy, most recently through the California Public Utilities Commission's (CPUC) Decision Approving 2010-2012 Energy Efficiency Portfolios and Budgets (D.09-09-047), which greatly expands the role of benchmarking in the Investor Owned Utility's (IOU) commercial efficiency programs. Two requirements (executive and legislative) initially established benchmarking in California, however, and remain key drivers in its progress throughout the state: 1) the Governor's Green Building Initiative (Executive Order S-20-04), whose goal is to reduce energy consumption in all state buildings by 20% by 2015, and 2) Assembly Bill 1103 (AB 1103), which requires benchmarking data disclosure at the time of an entire commercial building's sale, lease, or financing.

California has already overcome a significant number of issues as a result of the combined efforts of representatives from key stakeholder groups, including California legislators, the California Energy Commission (CEC), utilities, commercial buildings, the CPUC, and the EPA. Nonetheless, there remain some unresolved issues. As jurisdictions across the country have begun passing legislation to mandate benchmarking, these issues have proven to be widespread. Following is a discussion of the two primary challenges yet to be overcome: data confidentiality and the lack of a clear understanding of benchmarking's value.

Outstanding Issues

Customer data confidentiality and the ability for key decision makers to understand the value that benchmarking brings to their organizations have proven to be common constraints. While these are very different obstacles, where one is extremely technical and the other is more political, they are the central challenges impacting benchmarking implementation in California, and across the country. Although they appear to be separate issues, they are in fact very intertwined – are stakeholders able to see the value but unable to execute because of the technical data issues, or are we unable to resolve the technical issues because stakeholders don't see any

[2] Institute for Market Transformation. "Analysis of Job Creation and Energy Cost Savings from Building Energy Rating and Disclosure Policy". 2012. Available at http://www.imt.org/files/Analysis_Job_Creation.pdf

[3] NMR Group, Inc and Optimal Energy, Inc for the California Public Utilities Commission. "Statewide Benchmarking Process Evaluation". April 2012. http://www.energydataweb.com/cpucFiles/pdaDocs/837/Benchmarking%20Report%20(Volume%201)%20w%20CPUC%20Letter%204-11-12.pdf

[4] Eichholtz, Piet, Nils Kok, and John M. Quigley. 2010. "Doing Well by Doing Good? Green Office Buildings." American Economic Review, 100(5): 2492–2509. http://nilskok.typepad.com/EKQ1/EKQ_Doing_Well_AER.pdf

value? Following is further discussion, primarily using California's experience, to illustrate these two issues.

Customer Data Confidentiality

Utility customer data confidentiality is a core concern for building energy disclosure policies, and addressing it has played a significant role in the delay of AB 1103 implementation. Building owners are responsible for complying with the law and require energy consumption data to do so, but often cannot readily access this data because one or more of the tenants pay the utility bills. This is an obstacle for enabling compliance, and for gaining stakeholder buy-in to pass regulations. The IOUs have been working with the CPUC and CEC over the past few years to try and find resolution through suggestions such as non-disclosure agreements, aggregating data into 'virtual meters', and release of energy use data documents, among others. There are different approaches for addressing customer confidentiality concerns where building owners require tenant energy data; however, the complexity of logistical considerations must be appreciated for the system to be effective. These approaches and considerations are outlined below.

Individual written release for each utility customer. For California IOUs regulated by the CPUC, disclosure of customer-specific usage information requires express consent of the individual customer of record. It is widely acknowledged that the account-by-account individual written release process thwarts the legislative intent of AB 1103 by forcing a painstaking manual process that is difficult to maintain and may be impossible in cases where a current or former tenant cannot be reached, is disinclined to cooperate, or no longer exists. Tenants that are inclined to cooperate are often still unable to provide a timely written release, as many businesses require legal review and executive signature for such documents.

Aggregating multi-customer energy data for the entire building. One approach to protecting customer privacy is to have the utility aggregate the energy data for the entire building. In the case of buildings with multiple separately-metered tenants, this may effectively mitigate privacy concerns because individual tenant data cannot be determined. For buildings with a large number of meters, such as multi-tenant office towers, this offers an added benefit of making the data simpler and easier to manage for the building owner. Commonwealth Edison offers such a service to building owners in Chicago, which has made this approach very popular as a proposed solution. However, stakeholders need to consider a number of challenges, including:

- *Identifying all the meters in a building.* Utility information systems typically do not have specific identifiers that can be easily used to map meters to buildings. The building address may be used as a starting point, but still precludes automation. Some buildings may have multiple addresses, one meter may serve multiple buildings, and meters may be at a separate address than the building. Moreover, some metering situations necessitate excluding individual meters. In the case of one meter serving multiple buildings, sub-metering is necessary to accurately calculate the energy consumption of the individual building. Another example is net-energy meters, where on-site and grid power must be separated.

- *Integration with existing systems.* For utilities that have already developed Automated Benchmarking Services (ABS)[5] and have customers using the system, integrating them into a new system with aggregated meters poses significant technical challenges. Moreover, many of these customers may not be building owners and therefore a completely different set of processes, policies, and procedures is needed to serve both use cases. This could introduce undue confusion and complexity in addition to significant technical challenges.
- *Data quality.* The loss of granularity entailed with aggregating data introduces challenges for users and utilities to identify and correct mistakes.
- *Aligning meter readings.* All meters that need to be included in a building's total energy consumption may not be on the same meter read schedule, or periodic anomalies may preclude alignment of dates for aggregating monthly energy data consumption. This adds complexity to implementation of aggregation and could affect both the ability for a building to receive a score and its accuracy.
- *Number of applicable buildings.* Although aggregation of data from multiple accounts in a building may provide an additional measure of data privacy for some customers some of the time, there are many instances where no privacy protection whatsoever would be provided. One example is the common case where a single tenant occupies a landlord-owned building, or where one tenant is clearly the dominant energy user out of many. Setting constraints around the number or energy consumption of tenants required for aggregation adds even more complexity as tenants and energy usage are constantly changing.
- *Loss of value for building operators:* Benchmarking is most valuable to building operators when it provides meter-level insights into energy consumption trends. While aggregation can facilitate whole-building benchmarking and regulatory compliance, a single monthly usage total for an entire facility is less likely to give operators actionable insights into energy efficiency opportunities.

Energy data for individual meters without written release. A different approach is for the utility to disclose energy use data for each meter in a building to the building owner without the building owner obtaining written permission or any other data unnecessary for benchmarking. The building owner would be responsible for identifying the meters serving the building using a non-customer-specific identifier, such as a number identifying the physical meter, and the utility would provide the data under a nondisclosure agreement (NDA) such that the building owner could not use the data for any other purpose than the legislative intent. Providing individual meter data in this way circumvents the issues with aggregating data outlined above. The NDA would offer clear legal protection for both the utility and for tenants concerned that the building owner may misuse the information to their detriment. This approach also offers more customer privacy protection than the written release because only the necessary energy consumption data is disclosed, while more sensitive information, such as account numbers and interval meter data, remains confidential. For customers where the energy consumption data

[5] The EPA's Automated Benchmarking System (ABS) securely exchanges energy use and facility data between the EPA's Portfolio Manager tool and a third-party energy service company. Automated Benchmarking Service refers to the system the utility or other energy service provider implements using the EPA's ABS. For more information, visit the EPA's *Automated Benchmarking Technical Resources* page at: http://www.energystar.gov/index.cfm?c=spp_res.pt_host_preview_doc

itself is more sensitive, an opt-out path could be offered if valid business justification is provided.

Policymakers should take care to provide sufficient flexibility in regulations such that the optimal balance between protecting customer data and enabling regulations can be achieved. Each approach has advantages and disadvantages for both objectives, and more investigation is needed to challenge the underlying assumptions and understand the true nature and extent of tenant concerns.

As more state and local governments implement energy disclosure initiatives, and voluntary labeling programs, such as LEED, increase focus on measured energy performance, there is clearly a need and opportunity to address energy consumption data privacy at a national level and for a broader range of purposes than AB 1103. This would also be a more efficient way to engage stakeholders, create consistency across jurisdictions and utility service territories, and mitigate regulatory hurdles by creating standards that could be adopted on a voluntary basis and adapted when necessary.

Addressing utility customer data privacy is a key issue that needs to be addressed to enable the true market transformation potential of building energy performance disclosure policies; however, the delays in implementation of AB 1103 and success of other efforts suggest that policymakers may be more effective moving forward with regulations while working on this issue in parallel.

Understanding Benchmarking's Value

Another major hurdle California has encountered is a lack of prioritization by key decision-makers of the role successful implementation can play in meeting their goals. Communicating the value benchmarking can add to the various organizations involved may help overcome this. To date, there have been a handful of participating individuals who recognize its value, but not enough to provide the momentum and visibility necessary for actual implementation. This point is illustrated by the fact that five years since AB 1103 was passed in California, enabling regulations are still under development and the implementation date has been pushed back three years.[6]

Not having the support of utilities to endorse this energy tracking tool and promote it to its customers can be detrimental to benchmarking's ability to succeed in California and elsewhere. Utilities play a key role to their customers as ambassadors of resources that can help buildings save energy in a cost-effective manner. Furthermore, the information utilities are able to gather by having their customers participate in automated benchmarking is important data they can use to increase their portfolio's savings, and target the most applicable candidates for various programs.

Likewise, policymakers and local jurisdictions don't always understand the value benchmarking can bring to their areas of service. California currently has a number of goals that benchmarking can help provide steps towards meeting – greenhouse gas emissions reductions (AB 32), net zero energy (by 2020 for commercial and 2030 for residential), and budget reductions, to name a few. Benchmarking can play an important role in tracking those objectives

[6] As of May 4, 2012, the CEC was finalizing the 15 day language for the enabling regulations of AB 1103. It is expected that they will be adopted in June 2012; however, an official date has not been provided. The expected implementation date is January 2013.

as a high level metric, but only if it receives the support and backing of policy drivers to demonstrate its importance, and motivate those necessary to resolve outstanding issues.

To date, it's not clear that this complication has been formally identified amongst those working to effectively implement benchmarking. The key players who stand to gain the most from the universal application of benchmarking are jurisdictions, building owners, utilities, and evaluators. They also happen to be the key decision makers, and those with the most authority to make significant progress towards universal benchmarking.

Value for jurisdictions. State and local governments across the country are considering benchmarking regulations as a policy foundation to address energy waste and greenhouse gas emissions reductions in existing buildings, and catalyze local job growth by increasing the uptake of building energy improvements

In addition to California, four major U.S. cities – Austin, New York, Seattle and San Francisco – and the District of Columbia and the state of Washington have adopted mandatory benchmarking requirements for public and privately owned commercial buildings. Existing policies are projected to impact more than four billion square feet of commercial and multifamily residential floor space annually by 2014, and similar policies are being actively considered in more than ten other cities and states.[7]

Historically, policymakers have exercised little control over energy consumption trends in existing buildings. Whereas the energy consumption of new buildings is typically regulated by building energy codes, more than forty percent of commercial buildings are already at least thirty years old and were constructed prior to the adoption of energy codes in most states.[8] Financial incentives to improve the energy performance of existing buildings have had a limited effect on national building energy consumption trends, and legislative efforts to require energy performance standards or mandatory energy efficiency measures in existing buildings are not politically feasible in most states and local jurisdictions.

Yet, as greenhouse gas emissions inventories and other climate-related analyses have become more common, the imperative to address the existing buildings sector has become more urgent. In New York City, where 85% of buildings standing today will still be in use in 2030, commercial and multifamily buildings account for 80% of the city's greenhouse gas emissions and $15 billion each year in energy costs.[9] In San Francisco, where buildings account for nearly half of the city's greenhouse gas emissions, a recent analysis by the city found that it could take more than sixty years just to 'green' half of its building stock by focusing solely on new buildings, which historically account for less than one percent of the total stock each year.[10]

For these jurisdictions and others, benchmarking provides a sensible policy tool to begin addressing energy consumption in existing buildings. Improving awareness about energy performance among building owners and operators is a key step to unlocking private investment to improve building performance, which will create local job growth that does not require

[7] Institute for Market Transformation. "Building Energy Transparency: A Framework for Implementing U.S. Commercial Energy Rating and Disclosure Policy." July 2011.
[8] U.S. Energy Information Administration, "2003 Commercial Buildings Energy Consumption Survey: Table A1. Summary Table for All Buildings (Including Malls)." 2006.
[9] City of New York, "PlaNYC: A Greener, Greater New York." 2007.
[10] Mayor's Task Force on Existing Commercial Buildings. "Final Report and Recommendations for the City and County of San Francisco." 2009.

ongoing public subsidies to sustain.[11] According to a recent study by the Institute for Market Transformation, a national building energy rating and disclosure policy has the potential to create more than 59,000 jobs, reduce energy costs by $18 billion, and generate more than $7.8 billion in private investment in energy efficiency measures through 2020.[12]

New research is demonstrating the pivotal role of benchmarking in improving building energy performance. A 2011 survey of global real estate executives and building owners conducted by the Johnson Controls Institute for Building Efficiency found that organizations are more likely to improve building energy performance if they measure and analyze energy usage data on at least a monthly basis.[13] Another recent survey of facilities managers that benchmark their buildings using the EPA's ENERGY STAR assessment tool by Building Operating Management found that 70% of respondents used the resulting energy performance information to "guide energy efficiency upgrade plans," and 67% used it to "help justify an energy efficiency project."[14]

State and local jurisdictions with benchmarking regulations that collect and analyze benchmarking data can add another dimension of value. Most local governments know little about their privately owned building stocks beyond tax assessment data, and most governments know almost nothing about how these buildings use energy. Analyzing benchmarking data can provide actionable insights for local governments by correlating energy efficiency with building characteristics, such as geography (neighborhood or zip code), building age, tenancy type and other factors. This type of analysis can inform future building energy efficiency policy efforts and the best use of public dollars to incentivize energy efficiency. The data can also provide a feedback mechanism for a local government to evaluate the success of building energy efficiency programs or policies. With the exception of the state of Washington, all state and local governments with benchmarking regulations are now collecting benchmarking information for analysis.

Value for building owners. As with any other system to track cash flow, expenses, or assets, benchmarking building energy use is not only a critical component of energy management best practices, but also a mechanism to help make investment decisions about controlling energy use and costs. By comparing energy use intensity among buildings, building operators can gauge their use against other similar buildings and use types in a way analogous to comparing the gas mileage of cars.

Energy management is the process of monitoring, controlling, and conserving energy in a building or organization. Benchmarking is a critical part of taking a systematic approach to energy management that focuses on maximizing energy and costs savings. Understanding current and past energy use is how many organizations identify opportunities to improve energy performance and gain financial benefits.

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[11] Institute for Market Transformation. "Energy Disclosure & the New Frontier for American Jobs." 2012. Available at: http://www.imt.org/files/Energy_Disclosure_New_Frontier.pdf

[12] Institute for Market Transformation. "Analysis of Job Creation and Energy Cost Savings from Building Energy Rating and Disclosure Policy". 2012. Available at http://www.imt.org/files/Analysis_Job_Creation.pdf

[13] Johnson Controls Institute for Building Efficiency. "2011 Energy Efficiency Indicator Survey." 2011. Available at: http://www.institutebe.com/Energy-Efficiency-Indicator/2011-global-results.aspx

[14] Building Operating Management. "Careful Assessment of Energy Options can Show What Steps to Take." Dec. 2011. Available at: http://www.facilitiesnet.com/powercommunication/article/Careful-Assessment-of-Energy-Options-Can-Show-What-Steps-to-Take--12849

Benchmarking buildings enable building managers to:

- *Prioritize investments in a building portfolio.* Applied across a portfolio of buildings, benchmarking provides the foundation for improved energy management decisions, ranging from identifying the top performers to prioritizing the best candidates for upgrades.
- *Determine potential savings.* By comparing a benchmarking score to a "target score," benchmarking can suggest the energy savings potential of raising efficiency to, or above, average.
- *Monitor changes.* Scoring a building over a period of time can help evaluate the effectiveness of changes in equipment or management.
- *Demonstrate proactive management of energy issues.* Having a building's energy consumption data summarized and documented helps answer questions about energy use from upper management, outside vendors, investors, or local government agencies.
- *Receive positive publicity.* Being able to document a building's improved energy efficiency or reduced energy consumption provides a basis to communicate an environmentally-friendly image.

Value for utilities. Benchmarking represents a powerful mechanism for encouraging building owners and operators to improve building energy performance, and its widespread use could lead to higher penetration of energy conservation and efficiency improvements in non-residential buildings. For utilities that provide energy efficiency programs, including the California IOUs, benchmarking offers a mechanism to enhance the delivery of these offerings in ways that increase participation rates, improve customer satisfaction, and help meet energy savings goals.

Utilities can gain access to new sources of market intelligence for use in structuring and targeting energy efficiency programs, such as:

- Building characteristics (e.g. vintage, square feet and occupancy type) from facility profiles, useful in identifying market segments with high potential for savings;
- Whole building EUI and the ENERGY STAR energy performance scores that can identify potential customers for retrofit programs;
- Mechanisms to screen for retro-commissioning and incentive programs and to evaluate their effectiveness;
- Trends in EUI and ENERGY STAR scores to indicate the level of persistence of energy efficiency upgrades.

Additionally, facilitating benchmarking is an important customer service and encourages participation in utility energy efficiency programs by assisting customers who lack the knowledge and resources to establish their building's benchmark and providing utility account representatives with an opportunity to report benchmarking results to customers and discuss energy efficiency opportunities.

Supporting benchmarking initiatives by facilitating ease of access to energy consumption data can also add value to utilities that do not offer demand-side management programs. Implementing methods for making energy data more accessible, such as using the EPA's ABS to transfer data to Portfolio Manager, is becoming increasingly valued by customers and can also offer improved operational efficiency.

Value for evaluators. Benchmarking presents both a challenge and an opportunity for evaluators of energy efficiency initiatives. The primary challenge comes in finding ways to measure the impacts of benchmarking on energy savings. As with any evaluation, the task is to ascertain how much energy consumption would have been, absent the measure. With benchmarking, the measure is the provision of energy use and cost information to building owners and managers. The savings will result from changes in building operations, and from investments in more efficient building components. The evaluator must be able to find a causal link between the two. Energy program evaluators have methods that can be applied to solving this problem, but they require data collection over a long period of time, as well as detailed tracking information about changes in the building's operation and energy asset efficiency. To date, we do not know of any systematic evaluation that has attempted to measure benchmarking impacts.[15]

The opportunity for evaluators comes from the promise of benchmarking to provide meaningful long term energy use data for buildings, which could be invaluable for a variety of evaluation studies. For example, a comprehensive energy upgrade program should produce energy savings results that are robust enough to show up in the billing and benchmarking data, before and after the program treatment. Benchmarking data would also be useful in comparing populations of customers that have similar characteristics, showing the differences in energy consumption between program participants and non-participants. Because benchmarking encompasses both asset and operational efficiency, it could be used to measure savings from purely behavioral/operational efficiency improvements. Benchmarking data could also support process and market assessments of building energy use. If benchmarking became widespread, it would also be useful for load research, because it includes information about customer facilities that utilities have not had before. All of this presumes resolution of data confidentiality problems, and the ability of evaluators to access the benchmarking data for populations of facilities.

Conclusion

Being able to demonstrate the value of energy efficiency tools and resources to customers, local jurisdictions, and within utilities themselves is not just relevant to benchmarking. Its importance is applicable to all new and emerging technologies, programs, and services. Likewise with confidentiality; for California, and the rest of the nation, to reach net zero goals, it is necessary to overcome the idea that energy data is restricted to only the utility customer. In doing so, energy use can become more transparent, and a tool market actors can use to apply pressure to underperforming buildings. It is also possible to realize these benefits while maintaining a reasonable level of customer confidentiality and mitigating real or perceived negative impacts.

As of now, because of these major challenges, benchmarking has not yet reached the critical mass necessary to implement locally at the state level, and certainly not universally in such a way that it's naturally occurring across all buildings; however, on a voluntary basis it has

[15] NMR Group, Inc and Optimal Energy, Inc for the California Public Utilities Commission. "Statewide Benchmarking Process Evaluation". April 2012. http://www.energydataweb.com/cpucFiles/pdaDocs/837/Benchmarking%20Report%20(Volume%201)%20w%20CPUC%20Letter%204-11-12.pdf

become increasingly successful. These institutional barriers have proven to be more far-reaching than previously expected. Without key decision makers being able to recognize the value benchmarking brings to their organizations and the important role it can play in helping them to meet their goals, the full potential of benchmarking may never be realized. At this point, there is a need for high level policy drivers, and a lot of persistence, in order to make universal benchmarking in California, and across the country, a reality.

References

Barr, Amy, Douglas Mahone, Theda Silver-Pell, Tracy Narel, Martha Brook. "Benchmarking California's Buildings – Lessons Learned on the Road to Energy Use Disclosure". ACEEE Summer Study, 2010.

Building Operating Management. "Careful Assessment of Energy Options can Show What Steps to Take." Dec. 2011. Available at: http://www.facilitiesnet.com/powercommunication/article/Careful-Assessment-of-Energy-Options-Can-Show-What-Steps-to-Take--12849

California Public Utilities Commission. *California Energy Efficiency Strategic Plan*. 2008. Sacramento, CA.

City of New York, "PlaNYC: A Greener, Greater New York." 2007.

Eichholtz, Piet, Nils Kok, and John M. Quigley. 2010. "Doing Well by Doing Good? Green Office Buildings." American Economic Review, 100(5): 2492–2509.

Governor of the State of California. 2004. Executive Order S-20-04. Sacramento, Calif.: Office of the Governor.

Institute for Market Transformation. "Analysis of Job Creation and Energy Cost Savings from Building Energy Rating and Disclosure Policy". 2012. Available at http://www.imt.org/files/Analysis_Job_Creation.pdf

Institute for Market Transformation. "Building Energy Transparency: A Framework for Implementing U.S. Commercial Energy Rating and Disclosure Policy." July 2011.

Institute for Market Transformation. "Energy Disclosure & the New Frontier for American Jobs." 2012. Available at: http://www.imt.org/files/Energy_Disclosure_New_Frontier.pdf

Johnson Controls Institute for Building Efficiency. "2011 Energy Efficiency Indicator Survey." 2011. Available at: http://www.institutebe.com/Energy-Efficiency-Indicator/2011-global-results.aspx

Mahone, Douglas, Karen Herter, Michael Langley, Tracy Narel. "Universal Energy Benchmarking for Commercial Buildings – Making It a Reality in California." ACEEE Summer Study, 2008.

Mayor's Task Force on Existing Commercial Buildings. "Final Report and Recommendations for the City and County of San Francisco." 2009.

NMR Group, Inc and Optimal Energy, Inc for the California Public Utilities Commission. "Statewide Benchmarking Process Evaluation". April 2012. http://www.energydataweb.com/cpucFiles/pdaDocs/837/Benchmarking%20Report%20(Volume%201)%20w%20CPUC%20Letter%204-11-12.pdf

Saldaña, L. "AB 1103 Energy: commercial buildings: consumption." 2007. Section 25402.10 to the Public Resources Code, relating to energy.

Saldaña, L. "AB 531 Energy consumption data: disclosure." 2009. Section 25402.10 to the Public Resources Code, relating to energy.

U.S. Energy Information Administration, "2003 Commercial Buildings Energy Consumption Survey: Table A1. Summary Table for All Buildings (Including Malls)." 2006.

United States Environmental Protection Agency. ENERGY STAR® Portfolio Manager Overview. 2008. http://www.energystar.gov/index.cfm?c=evaluate_performance.bus_portfoliomanager. Washington, DC: US Environmental Protection Agency.