

Planting SEEDs: Implementation of a Common Platform for Building Performance Disclosure Program Data Management

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ABSTRACT

State and local governments are increasingly implementing building performance reporting regulations for private and/or public buildings, resulting in a rapid increase in data. But each jurisdiction has had to invest significant time and resources into custom tools and processes for combining Portfolio Manager data with other information sources and analyzing it. To address this challenge, the US Department of Energy developed the Standard Energy Efficiency Data (SEED) platform. SEED provides a flexible, free, secure, and private data platform for managing large datasets. The SEED source code is open source and extensible so that other parties can access the data, and offer add-on tools and services in a replicable way.

This paper will detail the varying processes that had started to emerge in New York City, Seattle, Washington DC, San Francisco, and Austin, and then summarize the features of SEED that were developed to address key challenges. SEED has the potential to significantly decrease the administrative effort required to implement performance-tracking programs and increase the quality of analysis. By aligning data formats and data management processes across jurisdictions, SEED can also help to ease reporting burdens for owners and contractors, facilitate parallel analysis and comparisons between jurisdictions, and increase the availability of products and services that utilize this data. Finally, the paper will explore the SEED's potential at scale in the market and the ongoing role for interested users and software developers to contribute resources and provide input on ongoing development.

Introduction and Background

Many cities have adopted rating and disclosure ordinances because they viewed information transparency as a straightforward and inexpensive means to drive market valuation of building energy performance. These ordinances include requirements for annual benchmarking of building performance, as well as reporting results either to the city or directly to affected private parties. There are currently nine major cities and two states that have enacted mandatory benchmarking (IMT 2013). These laws typically apply to all commercial buildings over 50,000 square feet (SF), though several target buildings as small as 10,000 SF, and six of the cities have provisions for multifamily properties as well. Altogether, approximately 5.2 billion SF of floor space in major real estate markets is now subject to these requirements.

However, when implementing these programs, cities are discovering similar challenges related to the administrative time and software cost burden of tracking buildings' reporting status, addressing data quality issues to ensure that the information is complete and accurate, managing compliance workflows that often involve a range of departments and staff, and tracking changes and edits to data as well as follow up action items. Many jurisdictions have

expressed a desire to utilize a standard data platform in order to lower the cost of implementing these tasks, while also allowing data to be compared more easily across jurisdictions.

The Standard Energy Efficiency Data (SEED) Platform embodies DOE’s vision for this common data platform. SEED is a software application that helps organizations easily manage data on the energy performance of large groups of buildings. Users can combine data from multiple sources, clean and validate it, and share the information with others. The software application provides an easy, flexible, and cost-effective method to improve the quality and availability of data to help demonstrate the economic and environmental benefits of energy efficiency, to implement programs, and to target investment activity.

This paper highlights some of the experiences that NYC, Seattle, Washington DC, San Francisco, and Austin have had while implementing their benchmarking programs, and discusses how SEED aims to help facilitate and improve these processes.

History and Purpose of SEED

The Department of Energy (DOE) initiated development of the SEED platform to help public agencies that are either implementing building performance reporting regulations and/or tracking the performance of their own buildings. Figure 1 shows the SEED workflow. SEED functions like an Excel or Access database program, in that each user has their own copy of the software or “SEED instance,” in which the user can enter and manage their own information.

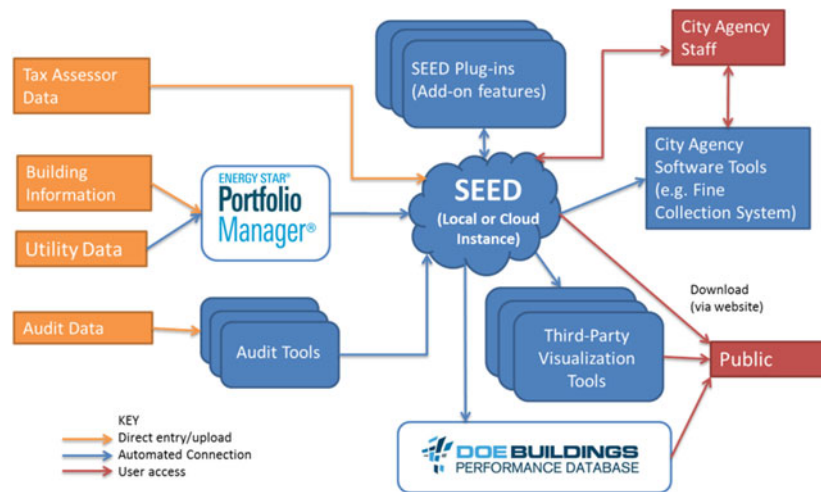


Figure 1. SEED work flow. (Courtesy of Marshall Duer-Balkind, DC Dept. of the Environment.)

City staff can import their Tax Assessor data, which is used to determine which buildings are subject to compliance, submissions from building owners through the EPA’s ENERGY STAR Portfolio Manager® tool (Portfolio Manager), as well as other data sources such as city planning databases, audit and retro-commissioning studies, and retrofit project reports. SEED assists with mapping the data into a standard format and matching information from multiple sources about the same buildings, through a combination of automated processes and user input. The user can then create groups of buildings and “tag” buildings with labels as needed for determining compliance, flagging errors, and other activities. Individual records, and fields within records, can be selected for export or sharing via the API. SEED features an Application

Programming Interface (API) so that external software tools can have read-write access to the data, as well as a plug-in architecture so that analysis and visualization tools can be added in a modular manner. Therefore, the private sector can offer tools and services, which can be easily marketed to and implemented by all SEED users.

In 2013, a beta version of SEED was released to and tested by about 10 state and local governments with mandatory or voluntary benchmarking programs. Based on their feedback, DOE developed a comprehensive set of performance features, which Lawrence Berkeley National Lab, Building Energy and the Institute for Market Transformation used as the basis to develop SEED version 1 (SEED V1). The DOE-LBNL-BE-IMT team has been engaging with the pilot users on a regular basis through an agile development process, in which the software is developed in an iterative and incremental manner based on ongoing feedback from the users (Kent 2001). SEED V1 was released as open source software in May 2014, and DOE plans to fund additional development based on market adoption and user needs.

TAX LOT #	ADDRESS LINE 1	POSTAL CODE	YEAR BUILT	USE DESCRIPTION	BUILDING COUNT	OWNER	GROSS FLOOR AREA F ²		ENERGY STAR SCORE		SITE EUI	MODIFIED DATE
							Min	Max	Min	Max		
10101/132e1	198832 SE Arthur Loop	10101-4795	1956	COMMERCIAL	1	Econohomes	68,177		74	75		5/1/14
10101/137f1	90256 S Cantaloupe Court	10101-4370	1910	COMMERCIAL	3	Conservice	51,688		86	62		5/1/14
10101/230e0	241773 W Apples Avenue	10101-6175	1982	COMMERCIAL	1	LGI Development	59,341		79	68		5/1/14
10101/2417d	4455 N Ash Lane	10101-7497	1982	COMMERCIAL	1	Asset Realty Group	330,369			425		5/1/14
10101/25e4b	162695 NW Monroe Alley	10101-8073	1964	COMMERCIAL	1	Memphis Invest	333,725		89	63		5/1/14
10101/27e4b	16645 W Ford Alley	10101-3986	1977	COMMERCIAL	1	Keller Williams Capital Properties	288,029					5/1/14
10101/2b7e0	181881 E Myrtle Street	10101-2717	2009	COMMERCIAL	1	Accurate Group	215,255		79	77		5/1/14
10102/3e6e6	243909 SW Tark Boulevard	10101-9544	1965	COMMERCIAL	1	@Properties	234,831		84	85		5/1/14
10101/34e1f	219222 SW Filbert Avenue	10101-6331	1997	COMMERCIAL	1	Pampea Properties	142,331		73	78		5/1/14
10101/36e1c	199110 W Myrtle Boulevard	10101-9430	2002	RESIDENTIAL-MULTI FAMILY	1	Econohomes	302,514			130		5/1/14

Figure 2. SEED V1 building detail view. Courtesy of Building Energy, Inc.).

The SEED platform is only one part of a suite of projects that the Federal Government is developing to help standardize, systematize and link data so that building owners, contractors, researchers, financiers, and other experts can aggregate and share information about building energy performance. Portfolio Manager, the Commercial Asset Score and Home Energy Score are other tools that are likely to generate data inputs for SEED instances. In addition, datasets from different SEED instances and other tools can be voluntarily contributed into the Buildings Performance Database (www.buildings.energy.gov/BPD), an anonymous, publicly accessible database of hundreds of thousands of buildings from across the country. These public tools, and a growing number of private tools, utilize a common set of data definitions, called the Building Energy Data Exchange Specification (BEDES) (www.buildings.energy.gov/BEDES). DOE intends for SEED to remain a fully interoperable piece of this system.

Using SEED for Implementing Benchmarking Laws

SEED is a custom software tool that can help streamline an otherwise manual and time intensive process, in which a range of departments and staff must work together to use tax assessor data to determine which buildings must comply, import Portfolio Manager data and match it to the tax assessor data, conduct data cleansing, determine compliance and exemptions, provide feedback to building owners, and then make the final data available to the public and utilize it for further policy and program design efforts.

Most cities have a home-grown suite of tools to conduct these activities, including Excel spreadsheets and Access databases. Seattle is the exception to this approach, having developed its own city-specific IT application. City staff members in Seattle say they now spend far less time processing data, and can focus much more time on helping building owners comply with the program requirements, as well as helping them use the information to improve their building's performance. Seattle's custom platform has demonstrated some of the operational benefits that SEED will provide to other cities when its full potential is realized.

Inter-Departmental Coordination

In most cities, several departments, such as the Mayor's office, the building department, the tax assessor's office, and the finance office are all involved in data management and compliance activities. Staff in each department often complete their portion of the work and send files via e-mails, which must then be merged or re-entered into a "master" list. This can be a laborious process, and also introduces significant potential for errors and version control issues.

In NYC, the Department of Finance (DOF) uses tax assessor data to develop a "Covered Buildings List" for energy use, and the Department of Environmental Protection generates a similar list of buildings that must report for water use. DOF mails notifications to each building owner. After the building owners have had time to enter their information, the Mayor's Office of Long-Term Planning and Sustainability (OLTPS), pulls building data from Portfolio Manager and sends it to DOF. DOF matches the records to the Covered Building List to identify buildings out of compliance and then sends the resulting list to the Department of Buildings (DOB), who issues notices of violation for failure to report. Meanwhile, OLTPS conducts analysis of the data. The entire process must be repeated annually.

In Washington DC, the DC District Department of the Environment (DDOE) manages the benchmarking ordinance, though they rely on the DC Sustainable Energy Utility (DCSEU) to maintain their benchmarking help center, and solicit information from other departments to generate their covered buildings lists and as input for their compliance process. These are very complex business processes, and it is a testament to the dedication of city staff that this process has worked as well as it has. But as disclosure laws expand to other cities, this resource burden can inhibit compliance and enforcement activities.

SEED aims to address this issue by providing a central database that all relevant departments and staff can utilize, with differing levels of access, such as read-only, read-write and administrative users. Each user can log in to SEED to upload their relevant datasets and complete their assigned activities. Instead of relying on shuttling data back and forth between departments, SEED will allow multiple parties to simultaneously access and work with a single

common data set, greatly reducing the labor and potential for errors inherent in the current process. In addition, SEED remembers previous versions of datasets, so that when a new year of data is entered, the records automatically update but previous years of data can still be seen.

Data Management

Tax assessor data. Tax assessor data is generally the best source of information about the building stock in any given city. However, since this data was developed with a different use in mind, there are several challenges in using it to determine which buildings should be subject to compliance. For example, since public buildings are not subject to tax assessments they frequently are poorly covered within the listings. In addition, tax assessor's data is structured in terms of parcel lots, while rating and disclosure ordinances are concerned with individual buildings. It is not uncommon to find multiple buildings on a single tax lot, or even one building that extends across multiple parcels. It is possible for one building on a tax lot to be compliant, while another on the same lot is non-compliant. In DC if any building on a tax lot is compliant, then the entire tax lot is considered in compliance. But NYC does the reverse, and sends a notice of non-compliance if any building on a lot is not in compliance.

SEED users can import their tax assessor data and use the interface to map the terms into the common BEDES format, and then define the relationship between buildings and tax lots and track compliance at a granular level. SEED remembers these decisions so that future data imports maintain the mapping of data terms and relationships between lots and buildings. As discussed later, users can also filter the records to determine which buildings are subject to compliance, which means that first step does not need to be done outside of SEED.

Portfolio manager data. Cities with rating and disclosure ordinances typically require owners to use the US EPA's ENERGY STAR Portfolio Manager® tool, and report a subset of that information. All cities, with the exception of Seattle, receive building data via Portfolio Manager's custom reporting templates, which are custom defined Microsoft Excel spreadsheets. City staff must then match this data against the entries in the Tax Assessor Data, to merge in the fields provided by the building owners and determine which buildings have successfully met the reporting requirements. If data is updated, the process must be repeated.

Some cities, such as Austin, have reported technical challenges when importing data using Portfolio Manager's reporting templates. The reporting templates do not preserve formatting or field labels, they cannot support reserved characters, and the character data limits result in cutting off data. These issues mean that the data that is imported is not always a reliable and complete representation of the data that was in the original Portfolio Manager record.

Seattle has developed their own custom web-based tool which uses automated Web Services to importing data directly from Portfolio Manager. This approach provides several advantages, such as permitting city staff to "pull" data from Portfolio Manager whenever desired, and to update their local data set without waiting for building owners to submit a report template. However, as this approach for downloading data directly from Portfolio Manager is not yet well supported, and some of the functionality needs to be expanded, for example to allow cities to only pull the fields that owners are required to report rather than the entire record.

SEED V1 is designed to handle Portfolio Manager data via custom report upload, and V1.1 will be able to make a direct connection using Web Services. In either case, SEED automatically updates the records with changes to field inputs or new years of data (and indicates that they were updated) without requiring the matching process to be manually repeated.

Matching tax assessor and portfolio manager data. Matching tax assessor and Portfolio Manager data has proven to be a laborious and time consuming challenge. In Washington DC, it takes staff at least one to three hours to clean up data each time it is imported. Some form of identifier, or identifiers, must be used to uniquely match the records. However, as mentioned above, parcel IDs often cannot be reliably used to identify individual buildings. Therefore, each city has developed a different approach for the unique key that is used for matching records.

Addresses are imprecise means of matching properties. A “building” may be viewed differently by the building owner then by the tax assessor, particularly when there are multiple smaller structures that share an HVAC system. A building may also have multiple street addresses and/or a “vanity” address, so there is no guarantee that the address a building owner enters into Portfolio Manager will match the tax assessor’s. Even when the building owner and Covered Building List address are the same, it could be expressed differently, for example “NW 5th St” versus “Fifth Street Northwest.” The engine in SEED is trained to identify these high probability matches and display them to a human reviewer for final review and approval.

To facilitate address matching, most cities have opted to assign a unique building ID number that can be matched to the Covered Buildings List. For example, Seattle generates a three to five digit numeric ID that is provided to the owner of each building, and must be entered into their respective Portfolio Manager record, while Austin uses the existing tax property ID with a three digit suffix (001, 002, etc.) appended to identify individual buildings on a lot.

In New York City building owners have to input two unique IDs for each building, the BBL, a ten digit borough, block and lot number which is separated by dashes, and a seven digit building ID number (BIN), which owners must get from the city’s on-line buildings database. Although having a unique building ID is much better than using an ambiguous address, data entry errors, can make it hard to match building records.

SEED attempts to simplify and automate this process by looking at multiple fields including Building ID, address and name, ignoring differences in formatting, and displaying likely matches to the user. For example, if the building ID number differs by a single digit but the address is identical or very similar, it is likely that the record is a match, and SEED will display it at the top of a listing of likely candidates for user review and approval. This process is much more efficient than forcing a user to blindly search through long lists of buildings to find records that might be a match. SEED then remembers these matches for future imports.

Duplicate records can also be a challenge, for example, if two different people submit a report for the same building. SEED will not create duplicate records in the database, and will recognize and reconcile duplicate submittals.

MATCH	PM PROPERTY ID	TAX LOT ID	CUSTOM ID 1	ADDRESS LINE 1	POSTAL CODE	GROSS FLOOR AREA	
	PM Property ID	Tax Lot ID	Custom ID 1	1400 n	Postal Code	Min	Max
Building from Source: DC_ESPM.csv Matched! Next unmatched building							
✓	1390065			1400 NY Ave	20005	177436	
Potential Matches from Source: Existing Buildings							
<input type="checkbox"/>		02122674		1400 N STREET NW		146901	
<input checked="" type="checkbox"/>	1124469	02230024	0223-0025	1400 NEW YORK AV NW	20005	211501	

Display: 10 buildings 2 search results

Figure 3. SEED interface to search for unmatched buildings (Courtesy of Building Energy, Inc.).

Reconciling data sources. When performing a more detailed assessment, one of the best ways to evaluate the accuracy of the data in a building record is to compare the data that was provided independently from multiple data sources. For example, year built, use type and address are all fields that are in both Portfolio Manager and tax assessor data, and the SEED user can choose which source is the most accurate or up to date. Seattle’s custom built application provides a screen with two columns, where the “primary” version of each data field, from the tax assessor’s database, can be compared to the value entered in within Portfolio Manager. This makes it easier to identify and troubleshoot discrepancies. SEED has taken this concept one step further, and includes individual columns for each data source, such as multiple years of information or audit data. The user can select which source should be the “master” value for a field.

Data cleansing. Most cities wish to apply range checks on fields in order to flag data that is outside of acceptable limits, such as building areas or EUI numbers that are suspiciously high or low, operating hours greater than the number of hours in a week, etc. The SEED team decided not to externally impose these bounds, as different cities may have specific circumstances. For example, cities may know the gross floor area of their largest building. Therefore, SEED users can use the filters to identify outliers, such as buildings with an EUI of less than 5, and flag them as errors. DOE and LBNL are also publishing the data cleansing methodology that is used in the Buildings Performance Database as a reference that jurisdictions can use.

Compliance Activities

Determining covered buildings and exemptions. Another challenge to implementing a rating and disclosure program is that the city must be able to track which buildings are subject to or exempt from reporting requirements. During initial program roll-out, the size threshold of buildings subject to compliance often changes each year, to allow a gradual phase-in of reporting requirements to increasingly smaller buildings. In addition, the building stock itself is not static. New projects are constructed or modified and buildings are bought and sold. Therefore, tax assessor data and compliance lists must be updated every year.

Moreover, each city has also defined differently categories of buildings that are excluded from the current reporting requirements. For example, both Austin and Seattle exempt industrial or manufacturing buildings, even if they are above the size threshold. San Francisco also gives one-time extensions for changes in building ownership.

SEED allows each jurisdiction to apply filters to determine the subset of buildings that are covered by the disclosure law, based on parameters such as size, use, age etc., and then save a given group as a Project, such as “2013 Compliance.” Individual buildings can be manually added or removed from a Project based on circumstances such as the change-in-ownership exemption. The next year, the Compliance Project can be copied over and modified as needed.

Determining compliance. Each city has determined its own metric and methodology to use when determining that a building is “in compliance.” Typical approaches are:

- Owner has successfully submitted a record for the building: Austin, New York City, Washington DC
- All of the above, and all required fields have been completed: none

- All of the above, and there is sufficient data to generate an annual EUI value: Seattle, San Francisco
- All of the above, and all other required data fields fall within acceptable limits: none

Although most cities currently base compliance only on successfully submitting a building record, these standards may change as the programs continue to mature. Since NYC’s compliance rate is now at 75% (NYC 2013), the emphasis is shifting to data quality and identifying EUI “outliers”, which may impact how compliance is defined in the future.

SEED provides the flexibility to accommodate any standard that a city has, by allowing users to filter the dataset according to any of this criterion. The identified building records can be grouped together into a separate project or tagged with labels such as “No EUI” or “Follow up,” which can then be used as a basis for driving more targeted enforcement and follow-up activities. Users can enter notes to track their activities.

The API will also allow integration with customer relationship management or fine tracking software. Based on conversations with the pilot cities, the team has agreed that anything that has to do with a building’s profile or energy use should be stored within SEED, while anything that has to do with the people associated with buildings should be stored in other tools that most cities already have, and can be linked to SEED.

STATUS	TAX LOT ID	ADDRESS LINE 1	POSTAL CODE	YEAR BUILT	USE DESCRIPTION	BUILDING COUNT	OWNER	GROSS FLOOR AREA FT ²	ENERGY STAR SCORE	SITE EUI	MODIFIED DATE
	10101/2417d	4455 N Ash Lane	10101-7497	1982	COMMERCIAL	1	Asset Realty Group	330,369		425	5/1/14
	10101/25e4b	162695 NW Monroe Alley	10101-8073	1964	COMMERCIAL	1	Memphis Invest	323,725	89	63	5/1/14
follow up	10101/2764b	16645 W Ford Alley	10101-3586	1977	COMMERCIAL	1	Keller Williams Capital Properties	288,029			5/1/14
	10101/36bfc	199110 W Myrtle Boulevard	10101-9430	2002	RESIDENTIAL-MULTI FAMILY	1	Econohomes	302,514		130	5/1/14
	10101/3ae71	12156 E Obama Court	10101-9210	1924	COMMERCIAL	1	Distinctive Properties	323,298	75	88	5/1/14
exempt	10101/3b74b	134217 SE Kennedy Lane	10101-4786	1978	COMMERCIAL CONDO	1	PropertyRate	390,302	85	55	5/1/14
follow up	10101/41bb1	236410 NW Cedar Way	10101-6831	1944	HOTELS/MOTELS	1	Schmidt Real Estate	388,473			5/1/14
follow up	10101/4aea9	168373 S Cottonwood Court	10101-7898	1911	COMMERCIAL	1	Boulder Creek Builders	302,708			5/1/14
	10101/4faf4d	57318 SE Wilson Loop	10101-1505	1909	COMMERCIAL	1	Hipercorpt	359,601	80	77	5/1/14
	10101/516bd	96586 S Alder Lane	10101-7820	1926	COMMERCIAL	1	Marketplace Homes	328,575	70	86	5/1/14

Figure 4. SEED interface for creating projects and labels (Courtesy of Building Energy, Inc.).

Utilizing the Data

Feedback to building owners. Because the reporting requirements of a new rating and disclosure program can sometimes be confusing, it is important that city staff provide ongoing feedback to building owners regarding their progress and the consequences of not complying. Good communication and feedback can raise compliance rates, increase data accuracy, and demonstrate that the city has committed resources to the program’s success.

But without automated processes in place follow-up for hundreds or thousands of buildings can demand an unsupportable level of staff resources and lead to long delays between reporting and receiving feedback. The challenge is further magnified because each building may actually be associated with multiple contacts and multiple addresses.

Each city has chosen a slightly different approach to this issue. San Francisco sends out email notices to inform building owners when they are in compliance, or why they are out of compliance. However, this is a time-consuming, manual process using email templates. DC, on the other hand, only mails generic notices of violation to building owners who have not met compliance requirements; no notices are sent to confirm that reporting was completed successfully. Similarly, NYC does not send anything to building owners other than an initial notification of their requirement to comply and, if a building fails to report, a notice of violation; owners receive no positive confirmation that they have successfully reported.

Often, the notice of violation is a generic form letter, and does not identify why the building is out of compliance. Since it may take several months before a building owner becomes aware of and can correct errors in their Portfolio Manager records, this means a city may receive updated information over an extended period of time.

Seattle, through its custom application and direct linkage to Portfolio Manager, has automated the feedback process to a greater degree, and therefore is able to send confirmation messages to contacts at multiple stages, including successfully selecting City of Seattle as a contact for the Portfolio Manager account, successfully sharing a building's Portfolio Manager record with the City of Seattle, and successfully submitting a record that fully complies with the regulations, or a notice of non-compliance.

Before this enhanced feedback system was established, compliance rates were very low; many building owners thought they had met all reporting requirements, not realizing that their information was incomplete. With the enhanced feedback the overall compliance rate in Seattle has risen to over 93% (Seattle 2014), one of the highest levels in the country.

SEED enables users to "label" buildings according to their stage of compliance, which can be used for follow up activities or integrated with other communication systems as discussed above.

Public access to data. One of the primary purposes of disclosure programs is to make building performance information readily available to the public. Therefore, it's important that the information be accessible and in an easily understandable format. Though San Francisco Department of the Environment worked with a third party vendor, Honest Buildings, to develop an interactive map displaying information about all buildings subject to the city's benchmarking requirements, and [subsequently migrated to the city's Socrata open data portal](#), most other cities are simply posting downloadable spreadsheets with the data. A spreadsheet is not the most visual or inviting format, must be updated every time the dataset is updated, and therefore is less likely to lead to the desired actions such as changes in purchasing and investment patterns.

Since SEED includes a standard API, it creates an economy of scale that will encourage other vendors to produce dashboards or other applications to share and display the underlying data. The information in the linked software can also update in real time as SEED is updated.

Other uses. Benchmarking program can help to policy makers and program administrators conduct program design, outreach and evaluation. San Francisco shares data with the city's internal San Francisco Energy Watch incentive program and the Green Finance SF PACE financing program, as well as external efficiency program partners. Austin Energy, the city's municipally owned electric utility, wishes to use the data to identify poor performing buildings, and then reach out to targeted building owners to encourage them to take advantage of the utility's energy efficiency incentive programs.

Taking SEED to Scale

Additional Use Cases

While initial development has focused on benchmarking and disclosure programs, there is already significant interest in expanding SEED to serve other local government use cases. At a minimum, SEED V1.1 and V2 will be able to manage all data covered in the BEDES format, making it possible to use the tool for audit and retro-commissioning reporting and compliance as well. Moreover, public entities have expressed a desire to use SEED with other related activities such as water benchmarking, GHG inventories, and energy and building code compliance.

SEED could also serve closely related use cases for managing information from multiple sources about large portfolios of buildings over time. For example, energy efficiency programs wish to track program participation, efficiency improvements and incentives, and the associated building performance pre- and post-installation. Similarly, building owners wish to track the performance of their own buildings and efficiency projects.

If SEED gains traction, these and other functionalities could be added, further increasing the use of a common data format and interoperability of datasets. An owner of buildings across the nation could use the same dataset to track performance of their own buildings, comply with disclosure laws in different jurisdictions, and report data for efficiency programs.

Core Open Source Software Development

DOE and LBNL plan to make SEED available as open source software, and will continue to support the development and maintenance of core functionalities such as data management (importing, mapping, cleaning, editing, etc), integration with Federal Government tools, basic reporting/exports, and support for the API and plug-in functionalities. DOE and LBNL will also develop resources and provide support for both end users and software developers.

SEED Software Community

In order for the tool to be useful and viable for the long term, a management entity is needed to provide ongoing maintenance to the code base, support software developers that wish to use the code, curate contributions to the code base, and potentially manage a repository of plug-in "apps" or another means for users and developers to find each other. While LBNL will serve as the open source management entity for the medium term, in the long term SEED could transition to an open source management model which would enable flexible ongoing development without being dependent on any single institution.

Third-Party Products and Services

Because the SEED software focuses on the database functionalities, private software developers, researchers and others are likely to undertake a range of activities to expand or deploy SEED, such as database hosting (SEED as a service); data collection activities, such as a user interface for owners to submit data; new functionalities, such as advanced statistical analysis and visualization; integration with other city databases and business processes; such as fine-tracking systems; public interfaces for disclosed data; and many others.

Conclusion

SEED provides a framework for managing large datasets about building energy performance, reducing custom application development costs, enabling all participating departments to directly access and work with this common data set, and, to the greatest extent possible, the automation of all mundane data processing activities.

But SEED is addressing tactical issues around implementing disclosure programs in order to achieve the broader goal of driving the growth of local markets for energy efficiency. The common SEED framework will help connect several core sources of information about buildings, creating the foundation for more sophisticated tracking of building performance. It will also make data available to the market in a consistent way and should accelerate the adoption of a common format and schema for building energy performance data. In turn, this will support the growth, and improve the interoperability, of products and services that use data.

As a result, the private sector will be able to conduct building management activities, capital investments and real estate transactions more accurately and at lower cost. And the public sector will be able to better tailor program and policy design to local market conditions, more effectively evaluate programs, and conduct parallel analysis and comparisons between jurisdictions.

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