Sample Specifications for a Building Performance Reporting Software Platform

Prepared by: Institute for Market Transformation

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Building Performance Reporting System Overview

Many cities have enacted policies to improve the energy efficiency of their local building stock, requiring annual building performance benchmarking reporting and disclosure. Administration of this ordinance requires handling data streams and communications from various parties. This document describes the components of a software solution, referred to as the Building Performance Reporting System (BPRS), that satisfies these requirements in order to minimize the demands on city staff (who are the primary users of the proposed platform) and streamline data collection.

The BPRS is broken down into three primary functional areas:

1. Buildings database – all functions to handle creation, collection, and storage of information related to the physical and operating characteristics of buildings, including energy and water consumption data
2. Customer relationship management – all functions for managing the information and processes related to the people associated with each of the properties in the building database
3. Auxiliary functions – all supervisory and administrative functions, as well as reporting and presentation of the data, that are desirable but not considered to be core requirements

Although these are listed as separate components, and may rely on different underlying software applications, the overall BPRS should, to the greatest extent possible, be seen by end users as being a single integrated solution, with a common user interface. Reliance on manual data exchanges to move information between different applications, using CSV files or other protocols, should be minimized.

Buildings Database

Creating the Covered Buildings List

The BPRS should be able to help a city develop the initial list of buildings that are required to comply each year under the ordinance. This list is based on set criteria under each ordinance and is typically based on:

- Building Size
- Building Use Type
- Building Occupancy Rate by Year

Each building is identified using

- Building Address
- Unique Building ID
- Tax Parcel ID (optional)
- Portfolio Manager Number (optional)

City staff will develop the Covered Buildings by merging data from multiple sources including but not limited to the local tax assessor, CoStar, building department permit data base, and the municipal water and waste utility. The BPRS should be capable of identifying which records

across the different datasets represent the same physical building, by automatically matching records based on the key building identification fields listed above or, when available, by overlaying the GIS coordinates of each building's footprint. It should also provide the capability to manually match/unmatch records for those building references that cannot be accurately matched using the existing matching fields. The BPRS should be capable of automatically creating new building records when the user uploads a new dataset, and allow the user to manually delete building records.

Building Hierarchy

The BPRS should be capable of maintaining a parent-child hierarchy of buildings, so that detailed information can be maintained at the building level when available, but the information will roll up to the campus level for data that cannot be captured at the individual building level. The BPRS should include provisions to allow manual editing of the relationship between buildings, so that multiple buildings can be easily combined into one record, or a single record can be split into multiple buildings when this is deemed necessary.

Collecting Annual Benchmarking Submissions

Most energy reporting for benchmarking data will be handled through Energy Star Portfolio Manager (ESPM), a free online software by the EPA.

The BPRS should be able to:

- Automatically download data on a user defined schedule
- Sync downloaded records with master database based on building ID, building address, EPSM ID or other user defined fields
- Avoid importing duplicate records each time by rejecting exact duplicates
- Import approximately 10 to more than 250 individual data fields per record
- Allow capture and storage of the data values for each reporting year, without overwriting data from previous years.

Determining Data Fields to Import

The BPRS should allow the user to define, on a field by field basis, whether the existing data values or the values in the imported records take precedence when data is being imported from an external source. This would include user-defined, rules based logic to define what actions take place in the following situations:

- The data field is populated in both the imported record and in the existing record, with different values in the two locations
- The data field in the existing record is blank, but the matching field is populated in the imported record
- The data field in the imported record is blank, but the matching field is populated in the existing record

Where rules have not been predefined and any of the above situations are encountered when importing data, the BPRS should prompt the user to manually select the correct action to take. These actions will determine which data will be stored as the "master" value for each data field, for

a given reporting period. The BPRS should maintain an audit trail to identify the source of each value that has been imported, and should retain any values that were imported, but are not currently considered to represent the master value for that field.

Data Quality Assurance and Control

Data quality errors typically fall into two categories: critical errors (generally missing or improperly formatted data) and warnings (values that fall outside of the normally expected range).

Building owners will be notified and required to correct all critical errors to be in compliance. Fields that were flagged with warnings do not necessarily need to be corrected, but the building owner must verify that the data is correct as submitted before the report will be considered to be in compliance.

The BPRS must be capable of:

- Automatically running a user defined set of data quality checks on each benchmarking report received.
- Flag each record to identify any fields that generated critical errors or warnings.
- Issue a status notice and next steps via email or on the user portal.
- Perform the above functions within 24 hours of the time the data has been downloaded from the ESPM website.
- Allow user to develop the rules to define the type of data check that will be performed for each field. These should include at a minimum the ability to:
  - Check for valid data in any required fields
  - Check for gaps in time sequence data
  - Check that data for each field falls within defined upper/lower bounds
  - Perform simple calculations to compare values across different fields or time periods.

Examples of typical error checking rules are documented in the Institute for Market Transformation's report "Managing Benchmarking Data Quality."[1]

Tracking Compliance Status

Each building record should clearly display compliance status, and user should be able to see how many buildings have complied to date for any given compliance year. This can be displayed on either an internal user-only interface or by running a report from the master database. The BPRS should be able to track to multiple deadlines, including for benchmarking reporting, benchmarking transparency, and any building performance requirements if applicable.

Compliance status can be one of the following:

- Submission received and in compliance
- Submission received and not in compliance
  - Action required: Critical Error (missing data must be provided)

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[1] **Managing Benchmarking Data Quality** – Institute for Market Transformation

- o Action required: Warning (owner must confirm that any suspicious data submitted was correct)
    - Submission not received and not in compliance
    - Approved for annual exemption
    - Other (with clarifying notes)

The "Other" category is designed to address records for buildings that do not fall under the standard compliance requirements. These may include, but are not limited to:

- Buildings that are not subject to the city's benchmarking requirements but have voluntarily chosen to report
- Buildings that fall under the ordinance but for extenuating circumstances have been granted a permanent exemption

Exemption Requests

The BPRS should manage tracking of exemptions on an annual basis, with exempt buildings considered to be in compliance even though energy performance reports have not been submitted. The user should be notified to review requests and mark the request as either "denied, accepted, or in progress." This status should be clearly reflected on each building's record.

Exemption forms should include, at a minimum:

- Building Information
- Contact Information
- Exemption Type
- Any evidence or reasoning behind exemption
- Which user reviewed the exemption

The BPRS should support processes that allow the user to review and respond to all exemption requests within one week of receipt.

Customer Relationship Management (CRM)

Tracking Basic Contact Information

Multiple points of contact for any given building are often needed to ensure ordinance compliance. The BPRS should allow the user to be able to see and edit all contacts associated with each building, as well as all buildings associated with each contact. This contact information will be used to track and manage all interactions with the key points of contact for each building, as described below. One contact should be able to be identified as the primary point of contact for a given building, with all other individuals included as secondary contacts. The information that can be captured for each contact should include, at a minimum:

- Name
- Title
- Role (e.g. owner, tenant, property manager, facilities manager, HOA. Consultant, or other. The role may vary for different buildings the person is associated with.)
- Phone number

- E-mail
- Mailing Address

Tracking Customer Interactions

The BPRS should be designed to track building contact interactions, automate many of the routine steps needed to notify building owners of their upcoming reporting requirements, and respond to their requests and submissions. The BPRS should have a search function that filters by contact information, company, building ID, building address and date. Every interaction with a stakeholder needs to be recorded by contact name and matched to the building(s) related to the inquiry. Notes should be organized so the user can see all notes for each building, ensuring consistency among all staff member users who provide stakeholder support.

Notes should document:

- Date of inquiry
- Contact information
- Building information (address, building ID)
- Notes to record what was discussed
- Status of inquiry (open, in progress, closed)
- Type of inquiry (a way to categorize common problems and/or questions like missing building ID)

This process should be synced with an email function so each sent/received email is automatically associated with the specific building and contact. For example, if the user uses Microsoft Outlook or MailChimp to send an email to a specific contact, this should be automatically linked with the building record in question in the CRM.

The BPRS should maintain a queue of all help requests that have been received so that when support staff log into the system, they see all the new requests that need to be responded to. Staff should have the ability to assign requests to different program users, and generate reports of the requests that each user has in their queue, to make sure that these are being dealt with in a timely manner.

Targeted Messaging

The BPRS must be able to generate targeted e-mail messages for individual recipients, using templates that are defined by users. These messages may be initiated manually, in response to a specific request being processed by the user, or automatically, in response to the execution of a rules based trigger.

Help Desk Responses

The BPRS should allow users to autofill template forms to quickly generate responses that resolve the most common issues. The templates should support mail merge functions that work with the e-mail system specific by the City so that the generic responses can be customized by automatically inserting the name of the person requesting the information, their e-mail address, and the building(s) that they were inquiring about. The BPRS should also track user authorship whether by login or a signature sign off.

Rules Based Responses

The BPRS should automatically notify stakeholders any time there is an activity or a change in status that they should be aware of. These messages will be triggered by the execution of a user defined rule within the BPRS. Some examples of expected triggered responses include:

- Compliance status updates – immediately after data quality checks have been completed on a building report the BPRS should automatically generate an e-mail that either informs the building owner that their report has been successfully processed and they are in compliance, or notifies them of any critical errors or warnings that were generated, and the appropriate actions that they will be expected to take. The system should be designed to send status notifications to building owners within 24 hours of the time the data has been downloaded from the ESPM website.
- Help Desk response – any time a user submits a request for assistance to the Help Center the BPRS should log the request and send a confirmation that the request has been received.
- Exemption requests – when a user submits a request for an annual exemption for their building the BPRS should log the request and send a confirmation that the request has been received. As soon as the exemption is either approved or denied, an automated notification should be sent to the building owner describing the determination that has been made and any next steps that the owner is expected to take.

Mass Communications

The BPRS should be able to:

- Directly send mass communications, using user defined mail merge templates, or manage a listserv that can be easily exported to the City's selected e-mail platform, such as MailChimp or Constant Contact.
- Perform queries to select records for a communications campaign based on criteria such as contact type, company, building type, building size, and compliance status.
- Output contact information for a filtered list of buildings in a printed or electronic format compatible with the needs of third party mailing services for physically mailed notifications.

Auxiliary Functions

In addition to the core functions described above, the BPRS should provide support for other interfaces that perform various functions for both the city staff user and the public.

Program Dashboard

A program dashboard for internal staff will be used to monitor the status and activity level of the overall program. Examples of the types of metrics on the dashboard are:

- Compliance status – number/percent of buildings that fall under each of the compliance categories listed above

- Help desk support activities - number of interactions with stakeholders processed over the preceding day/week/month, average time to resolve an inquiry, types of issues addressed
- High priority buildings – flagged buildings that need attention
- Number of exemptions in queue – the number of buildings that have submitted exemptions and are still waiting review

All metrics should be presented in highly graphical and interactive manner, to make it easy for the user to track key metrics, and to customize how the data is being displayed.

Stakeholder Interface

A public facing, web-based interface, will give building owner/managers or benchmarkers a way to check on compliance status, exemption status, inquiry status, compliance deadlines and other important ordinance-related information in real-time. Services could include:

- Requesting building ID
- Checking compliance status for benchmarking and any additional requirements (audits)
- Submitting exemptions and checking status
- Links to resources and services
- Submitting extensions and checking status

Data Transparency Portal

The BPRS should automate the process of uploading the building performance data stored in the BPRS to a user friendly, visual interface that the user can interactively filter. The BPRS should be designed to update data on the transparency portal in real-time, or once per day. The visual interface may be any of the following [to be defined by each city]:

- Interactive map
- Online interactive list
- Downloadable spreadsheet

Appendix A – Additional Functionality

The following are additional functionalities that cities have expressed an interest in. They do not fall into "core functions" of software requirement but are helpful add-ons that may be considered necessary in the future.

Building Stock Database Syncing

Some cities desire the ability to sync their information with additional data sets beyond the local tax assessor data, such as CoStar or GIS files. This adds functionality to extract data from these sources and match the data fields with the values in the BPRS.

Building ID Generation

The Unique Building ID (UBID) methodology developed by the DOE should be closely examined as a potential standard for use by cities that have already have access to the building level GIS data that it requires.

Building Scorecards

Several cities now generate scorecards to further educate building owners on ways to improve their efficiency. These scorecards should be automated to deliver highly targeted messages to individual building owners that:

- Use simple-to-understand language and graphs to influence building owners and operators to take action;

- Leverage competition as a motivating force, by comparing the building's performance to similar local buildings;

- Estimate the energy and dollar savings that could be realized through energy efficiency improvements; and

- Inform recipients of actions they can take to save energy and decrease the cost of retrofits, such as enrolling in utility incentive programs.

The BPRS should support different types of messaging in building scorecards based on building size, building energy star score, and contact type. Scorecards are typically sent out about a month or two after compliance date.

Energy/Water Audits

Cities that have requirements for certain buildings to conduct periodic audits need a way to collect the detailed information that those reports will include. The BPRS should be capable of importing audit reports from DOE's Asset Score tool and other applications using the DOE's BuildingSync protocol, and link the data received to the appropriate building record within the BPRS. In addition to importing the electronic data, the BPRS should also be capable of collecting and linking PDF files, for situations where copies of signed reports or approved certifications need to be maintained.

Appendix B – SEED Platform Application in the BPRS

The U.S. Department of Energy, in partnership with Lawrence Berkeley National Lab and the National Renewable Energy Laboratory, has developed the **Standard Energy Efficiency Data** (SEED) Platform to assist governments in managing their building performance data and programs. The SEED Platform is an open-source, web-based data platform that can house data from a variety of sources and clean, analyze, and share this data. Because SEED is open source, it is available for jurisdictions to implement in-house, or could be utilized by software vendors who wish to integrate any or all of its capabilities as part of their platform offering to cities. The table below shows the functions of the BPRS that could be performed "of-the-shelf" by SEED.

Function	Available in SEED?
Creating the Covered Buildings List (CBL)	SEED was built to handle the process of merging multiple datasets that contain very different data (tax assessor data, real estate data, etc.), based on a common field such as address or ID. It is able to import any data that is "flat" (i.e., one record per building); there is no restriction on the number of fields or field types. SEED allows users to specify fields to match the data on, including Address, Unique Building ID, Tax Lot ID, a Custom ID, and Portfolio Manager ID. Users can also edit as well as delete existing records "by hand".
Building Hierarchy	SEED can maintain many to many relationships between buildings and parcels/tax-lots; near term development includes ability for users to create relationships between buildings (similar to the ESPM Campus relationship) in SEED and to track ESPM campus data fields.
Collecting Annual Benchmarking Submissions	SEED matches benchmarking records to existing buildings based on IDs specified by the user (Address, Unique Building ID, Tax Lot ID, a Custom ID, and Portfolio Manager ID). It discards records that are exact duplicates of data already imported into the database. There is no restriction on the number of fields imported. It is possible to import a file with just 1 field, or more than 300 fields, although that many fields may impact performance. Data can be imported based on a "Cycle" which allows keeping the data for each reporting year without overwriting data from previous years. Users can import ESPM Custom Report template reports (CSV/XLSX) files that have been downloaded from ESPM. In addition, SEED is on track by Fall 2018 to automatically download data from Portfolio Manager into SEED.
Determining Data Fields to Import	Currently, the program will not overwrite existing data with blank data from a more recent import. New refactoring of SEED will allow development team to add functionality for users to determine which fields are "locked" and shouldn't be updated from imported data.
Data Quality Assurance and Control	Users can define data quality rules for any field in the dataset and specify user-defined labels to automatically apply those labels to records that do not pass the DQ check. The data quality rules that can

Function	Available in SEED?
	be defined include specifying valid data for any field (including text fields) as well as minimum and maximum values.
Tracking Compliance Status	SEED offers the ability to label records 1) "by hand" for individual records, 2) by filtering and applying labels to all the records resulting from that filter, or 3) via the data quality check rules. The program can then filter records based on those labels. SEED does not include predefined reporting capabilities to provide detailed analytics on compliance rates.
Exemption Requests	SEED can track exemption requests if the user edits specific fields related to exemptions (in the Detail view), and users can add labels to identify records that are exempt. The data can then be filtered based on those labels to include or exclude exempt buildings.
Tracking Basic Contact Information	SEED users can track contact information that would be available in a spreadsheet.
Tracking Customer Interactions	SEED users can track interactions on a limited basis in a Notes field in SEED.
Targeted Messaging	No
Mass Communications	No
Program Dashboard	No
Stakeholder Interface	No
Data Transparency Portal	SEED is built using RESTful Application Programming Interface (API) protocols which allows other programs to connect to it via API calls.