Building Energy Data Exchange Specification: *Strategic Working Group Recommendations*

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Disclaimer

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Executive Summary

ES.1 Background

The U.S. Department of Energy created the *Building Energy Data Exchange Specification* (BEDES) to facilitate the exchange of information on building characteristics and energy use in an inexpensive and unambiguous manner.

The *BEDES Dictionary 1.0* was developed by DOE to support the analysis of the performance of buildings by providing a common set of terms and definitions for building characteristics, efficiency measures, and energy use.

The *BEDES Strategic Working Group Recommendations document* is a guide to how the *BEDES Dictionary* can be brought to market and provide the services for which it was designed.

The DOE SEED (Standard Energy Efficiency Data) Platform™, is a software application to help organizations manage data on the energy performance of large groups of buildings, using the BEDES terms and definitions.

ES.2 Recommendations

Below are summaries of our seven key recommendations for implementing BEDES:

1. **Lead by Example**. DOE's *Building Technology Office* should continue to support BEDES-compliant tools wherever possible in its portfolio. Other DOE Offices, e.g., the Federal Energy Management Program (FEMP), have developed tools such as eProject Builder, which will be BEDES compatible. In addition, some programs such as the Weatherization and Intergovernmental Programs Office's (WIPO's) State Energy Program, Home Performance with Energy Star, or the Better Buildings Challenge, could use the SEED Platform directly to manage program data. BEDES is also designed to be compatible with tools across the federal sector, e.g., EnergyStar's Portfolio Manager. By using BEDES-compatible tools, DOE can lead by example in introducing BEDES to wider markets both in the public and private sector.

2. **Naming and Branding**. Our recommendation is that there be a name, logo, and tagline for BEDES, and that these are all trademarked so that the brand is recognized and valued in the market. The logo should be consistent with the logos for the related data tools of BPD and SEED.

3. **Develop Compliance Paths**. BEDES should offer two paths for compliance: In "mapping compliance" an implementation documents how the data fields map to

BEDES terms. In “exchange compliance” an implementation publishes an exchange schema that uses BEDES terms.

4. **Pilot and Evaluate**. Pilot projects with early BEDES adopters are recommended in order to learn how BEDES is used in practice. Several public and private entities have expressed an interest in being an early adopter of BEDES and potentially also using the SEED Platform. These groups can serve as pilots that should be both supported and evaluated for making improvements to future updates to BEDES. The pilots can be used to determine if BEDES contains all the necessary terms and definitions to support the pilot implementation needs.

5. **Provide Maintenance and Updates**. There is a need for the BEDES implementation team to provide updates and maintenance, with input from the BEDES Community. The current recommendation is that the BEDES dictionary be updated twice a year to all for new terms and definitions to support user needs.

6. **Transition to a Non-Profit Foundation**. BEDES is currently supported by DOE and managed by Lawrence Berkeley National Laboratory (LBNL). The recommendation is that both BEDES and SEED move toward a self-supporting model, managed by a non-profit organization. The funding strategy for the foundation could include, but is not limited to membership dues, fees for certifying mappings and compliance, paid technical support, etc.

7. **Support BEDES becoming an industry standard**. The goal for BEDES is to become the *de facto* industry standard for building energy data exchange. The BEDES Strategic Working Group explored the issue of whether to pursue the adoption of BEDES as an *actual* industry standard, e.g., ASHRAE, ANSI-ASTM, or ISO, and determined that it should be postponed to a later time and that the short-term effort should be made to have it used widely and changed organically before being codified as a formal industry standard.

Our final recommendation is to acknowledge the role of stakeholders as champions in supporting BEDES. This is not a “formal” recommendation, as it relies on the behavior of the individuals and their organizations, but it is important to recognize its importance here as a vehicle for BEDES adoption.

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Introduction to BEDES

The *Building Energy Data Exchange Specification* (BEDES) was created to facilitate the exchange of information on building characteristics and energy use in an inexpensive and unambiguous manner. BEDES is intended to be used in tools and activities that help stakeholders make energy efficiency investment decisions, track building performance, and implement energy efficiency policies and programs.

The *BEDES Dictionary 1.0* was developed by DOE to support the analysis of the performance of buildings by providing a common set of terms and definitions for building characteristics, efficiency measures, and energy use.

This *Strategic Working Group Recommendations Document* is a guide to how the *BEDES Dictionary* can be brought to market and provide the services for which it was designed. In addition to the *BEDES Dictionary*, it will be necessary to create "BEDES Compliant Exchange Formats," which will be schemas and standardized import/export file formats developed from BEDES terms for various key use cases.

Process for implementing BEDES

The process for the *Strategic Working Group Recommendations Document* started with the *BEDES Scoping Study* (2013), which identified several of the key issues needed to bring BEDES to the market. Following the release of the Scoping Study, Lawrence Berkeley National Laboratory (LBNL) convened a series of stakeholder working groups to provide input and feedback on the development of the Strategic Working Group Recommendations Document. The stakeholders met five times over a period of eight months to discuss the implementation issues and make recommendations to the team.

The stakeholders from the *BEDES Strategic Working Group* identified seven issues for BEDES implementation:

1. Identifying the goals for BEDES implementation
2. Naming & Branding for BEDES
3. Providing maintenance and user support, including exchange formats
4. Updating, designing future revisions and new functionality
5. Determining the best strategy for the organizational host
6. Promotion and market engagement
7. Adoption as a technical standard

Based on the discussions with the Strategic Working Group, LBNL developed seven recommendations, which were in turn reviewed by the SWG. These recommendations form the basis for the Strategic Working Group Recommendations document.

BEDES Components

The term “BEDES” refers to a number of linked components. These include:

BEDES Dictionary. This is the dictionary of terms and definitions used to characterize buildings and the energy used in buildings. The terms and definitions were taken from a variety of sources and the goal was to have standardized set that could be used by implementers to develop *BEDES Exchange Schemas* that would facilitate the exchange of information.

BEDES Exchange Schemas. While BEDES is a comprehensive dictionary, it will need to be incorporated as differentschema to allow stakeholders to be able to exchange data for specific use cases, such as transferring commercial building energy audit data. BEDES was developed to meet the needs of three initial use cases: 1) energy efficiency investment decision making, 2) building performance tracking, and 3) energy-efficiency program implementation and evaluation. Over time, BEDES implementers will develop a set of BEDES compliant/compatible implementation “exchange formats” whose schemas are documented and which have standardized input and output file formats. These schemas could then be used by anyone, e.g., software developers, public entities such as cities or states, needing to characterize buildings within that use case.

BEDES Community. The BEDES Community is a diverse group of stakeholders, including software developers, government entities, such as cities and states, energy consultants, and energy providers, e.g., utilities. A strong BEDES Community will be crucial to the success of BEDES for standardizing data exchange, both from a technical and implementation standpoint.

SEED Platform™. In addition to BEDES, the SEED (Standard Energy Efficiency Data) Platform is a related, open source database tool that uses BEDES terms and definitions. SEED is a database and accompanying user interface that DOE developed to help entities, such as cities and states, manage the energy performance data on large groups of buildings. The SEED interface helps users translate their data into the BEDES format, and then manage the data and share it with others. As the community of SEED users grows, their data will be standardized in BEDES compliant formats. In parallel, as various programs adopt BEDES compliant data practices, it will be easier to import into SEED. In addition, SEED will export data in standardized BEDES exchange formats, which will again strengthen the use of BEDES as a standard method of exchanging data.

Recommendations for Implementing BEDES

Below are our seven key recommendations for implementing BEDES.

Recommendation #1: Lead by Example

DOE's Building Technology Office is committed to using BEDES compliant tools wherever possible in its portfolio. The data tools developed by the Building Technology Office should be the first targets for BEDES deployment. Other DOE Offices have developed BEDES compatible tools, such as the Federal Energy Management Program (FEMP)'s eProject Builder. In addition, some programs such as the Weatherization and Intergovernmental Programs Office's (WIPO's) State Energy Program, the Building Technologies Office's Home Performance with Energy Star program, or the Better Buildings Challenge, could use SEED directly to manage program data. BEDES is also designed to be compatible with tools across the federal sector, e.g., EnergyStar's Portfolio Manager. By using BEDES-compatible tools, DOE can lead by example in introducing BEDES to wider markets both in the public and private sector.

BEDES is already compatible, or will be, with the following BTO tools: Building Performance Database (BPD), the Standard Energy Efficiency Data (SEED) Platform, Home Energy Score (HES), BuildingSync, and the Commercial Building Energy Asset Score. BEDES will also be compatible with the EPA's Portfolio Manager tool. In the upcoming year, official mappings and import/export formats will need to be published for all these tools. Other related programs include Home Performance with Energy Star (HPwES), which is also interested in using SEED to manage data from program partners.

Equally important to the development of BEDES-compatible tools is the role of federal agencies as vocal and visible supporters. Several channels can be exploited to communicate BEDES to potential users, including but not limited to: FEMP First Thursday Trainings; EPA EnergyStar Portfolio Manager webinars; pop-ups on the Building Performance Database; and release notes on the home and commercial asset scoring tools.

Examples of other federal tools that have overlapping use cases with BEDES could also be mapped or aligned in the coming year, including COMcheck and REScheck, tools that are used for code compliance. In addition, other federal tools should be identified and reviewed as candidates for BEDES mapping, as time and resources allow.

To facilitate this process further, the BEDES team should contact each of the federal tool deployment teams to explain BEDES. This will also require the development of materials to help engage Federal programs and inform them about the process and benefits of aligning with BEDES.

Recommendation #2: Naming and Branding

The Strategic Working Group recommended that there be a name, logo, and tagline for BEDES, and that these are trademarked so that the brand is recognized and valued in the market.

Name. The recommendation is that the name "BEDES" be kept for the overall activity, i.e., data exchange, and that individual components be referred to with "BEDES" as a descriptor.

Examples of how the BEDES name is to be used include:

- The *BEDES Dictionary 1.0*
- The *BEDES Use Case Schemas*
- The *BEDES User Forum*

Given that the name "BEDES" is often mispronounced, the SWG debated alternative names and acronyms, including:

1. BEEDS--Building Energy Exchange Data Standardization
2. BEDES--Building Energy Data Exchange Standardization
3. BEEDES--Building Energy Efficiency Data Exchange Standardization

The recommendation from the SWG was to keep the name BEDES but include a pronunciation as well, e.g., BEDES (pronounced /bi:ds/ or *Beeds*), at least initially until the name became ubiquitous.

The SWG also discussed what the initial BEDES product should be—was it a "dictionary," "glossary," "nomenclature," "lexicon," "taxonomy," or "terminology"? After much discussion and debate on the intended format, function, and design of the product, "dictionary" was selected as the best term to describe this non-hierarchical listing of standard terms and definitions. Accordingly, the first BEDES product will be named: *The BEDES Dictionary 1.0.*

There was also a recommendation from the SWG that the BEDES name and version control reflect different levels of updates. So a minor revision to BEDES 1.0 would be BEDES 1.1, but a major revision would be BEDES 2.0. The recommendation going forward would be that the next two six-month updates planned for FY 15 be listed as BEDES 1.1 and BEDES 1.2.

The experience from EPA Portfolio Manager suggests that future software developers that use BEDES be notified at least a month (if not more) in advance of a BEDES update to allow them to update their programs.

Logo. In addition to naming, there is a need for a BEDES logo and a tagline. "BEDES" is part of a family of data tools supported by the U.S. Department of Energy. The other

tools are the Building Performance Database (BPD) and the Standard Energy Efficiency Data (SEED) Platform. A new set of logos has been developed for BPD, SEED, and BEDES, as shown in figure 1 below.

Figure 1. Logos for BPD, SEED and BEDES

Taglines. The related recommendation is that BEDES branding should include a tagline, e.g., "*BEDES—For faster, easier, and universal building energy data exchange*"

Other taglines proposed by the Strategic Working Group included:

- "For efficient universal performance data exchange"
- "Unlocking our energy future"
- "Industry-recognized universal building energy data exchange"
- "The dictionary for buildings energy performance exchange"
- "Building energy data sharing made simple"
- "Improving energy performance in buildings through universal data exchange"

- “Standardizing the performance of building data”

Our recommendation is for:

BEDES Dictionary 1.0—for efficient, universal exchange of building energy data

Of course the real test is when pilot implementers and users use BEDES and say “That was easy and it helped me with “efficient universal exchange of building energy data”. Early adopters can help spread the word to others.

Trademark and Branding. The team recognizes the value of trademarking and branding the BEDES name and logo. One of the reasons for trademarking the name BEDES is that it would allow for clear recognition for certifying compliance with the use of BEDES terms and definitions. While the discussion on compliance is covered below in the section on User Support, the recommendation is that trademarking be pursued for the name and logo.

An example of a well-branded product that features interoperability that was shared by an SWG member is the ANT+, which could be a useful model looking at trademarking and branding BEDES. The website for ANT+ is here:

http://www.thisisant.com/

In addition to trademarking the BEDES name and logo are the responsibilities for monitoring its use. These responsibilities will initially need to be taken by DOE, and eventually transferred to the BEDES organization, as discussed in a later section.

It would be very interesting and helpful to track feedback when communicating BEDES to new parties. It is also important to track “What BEDES is NOT,” as demonstrated with large industry orgs – there can be a misconception in what BEDES is, how it affects a database structure, and cost. A case study could be in order (eventually) to show avoided costs as a byproduct of using BEDES.

Recommendation #3. Develop Compliance Paths

The long-term vision is for a BEDES organization to review, support, and promote BEDES-compliant products. A key part of this effort will be to facilitate two different paths for compliance: through Mapping and Exchange, as shown in Table 1. Mapping compliance documents the relationships between the terms and definitions used in a product and the associated BEDES terms. Exchange compliance takes Mapping compliance one step further by establishing a schema for exchanging that information electronically.

Table 1. BEDES Compliance

	Mapping Compliance	Exchange Compliance
Product	Document showing mapping to BEDES terms	Schema with BEDES terms
Applicability	Software tools, schemas, databases, data forms, etc.	Schemas
Map to BEDES terms[1]	Yes	Yes
BEDES team approves mapping	Yes	Yes
BEDES team approves schema[2]	Not Applicable	Yes
Public publishing on BEDES website	Yes	Yes
Right to use "BEDES" in product marketing	Yes	Yes
Examples	Mapping of: CEUS, CBECS	BuildingSync Home Performance XML Green Button

1 Not all BEDES terms have to be used, only those that apply. Additional fields that are out of BEDES scope are allowed.

2 The exchange schema does not apply to the database or internal schema, only to files meant to exchange data in or out of software.

Mapping Compliance. In "mapping compliance" an implementation ,such as the Commercial Building Energy Consumption Survey (CBECS), submits a Mapping Document to the BEDES implementation team for verification, which shows how the fields in the specific implementation map to the BEDES terms. The template for the mapping will be provided by the BEDES implementation team. The mapping could be

for a number of different implementations, e.g., software, survey, database, schema, etc.

Once this mapping is approved by the BEDES implementation team, the application can claim to have a “BEDES-Compliant Mapping.” This mapping can be made publically available so that all market actors can translate data from that data format into the BEDES format in a consistent way. This enables BEDES to act as a “Rosetta stone” to translate data between any other two formats.

To show mapping compliance, the application does NOT need to have an electronic file format that can import and export data (see Exchange Compliance). Mapping compliance may be a less expensive option because it does not require any additional software development. It is also a viable option for applications that do not hold any data, such as survey forms and data collection protocols, pre-existing research datasets, or for applications that are no longer supported but whose data is still in use.

Exchange Compliance. The BEDES implementation team is expected to develop or adopt, in partnership with implementers, standard BEDES-compliant Exchange Schemas for various use cases, such as commercial and residential audit data, energy data, energy efficiency data, etc. Schemas organize the terms into a hierarchical structure, and can have required and optional fields, as well as procedures for validating that the data has been entered correctly and exchanged successfully. Where appropriate and desirable, these BEDES-compliant Exchange Schemas will be adopted from or modeled after established formats, such as Home Performance XML for residential audit data, BuildingSync for commercial audit data and Green Button for energy data. The BEDES-compliant Exchange Schemas can have one or more formats, e.g., XML, CSV, JSON, etc., allowing the market to exchange data that is standardized and widely understood by all parties involved in the data transaction. The BEDES implementation team would release the BEDES-compliant Exchange Schemas (on the website, for example), but it would be up to the software developers to implement them.

Note that it is the *schema* that complies with BEDES, while individual tools and import/export files comply with the schema. .Software tools could show “Exchange Compliance” with multiple exchange formats. For example, a software tool used for auditing could show “Exchange Compliance” for both residential and commercial audit schemas.

There is a still-to-be-resolved issue about whether software products should be able to say they are BEDES-compliant even if they didn’t publish their proprietary schema. Since BEDES compliance is essentially about the exchange involving other parties, they could be required to publish only their import/export schema, not their internal database structure.

In both compliance cases, terms that are outside of the scope of BEDES would be allowed. A tagging mechanism could also be applied to be able to identify which terms are in the BEDES dictionary and which are not. Version control will become important as new terms get added to BEDES over time.

Another strategy to pursue would be to work with initial pilots that could help formalize mapping capabilities to allow multiple tools to connect, as opposed to one-on-one customization. In addition, the BEDES support team can publish guidelines on how to map fields to BEDES, giving several examples of mapping strategies.

Recommendation #4: Pilot and Evaluate the Use of BEDES by Early Adopters

While BEDES beta has already been extensively used within DOE, pilot projects with early external adopters are recommended in order to learn how BEDES can be used in practice. Several public and private entities have expressed an interest in being an early adopter of BEDES and potentially also using the SEED Platform. These groups can serve as pilots that should be both supported and evaluated for making improvements to future updates to BEDES. The pilots can be used to determine if BEDES contains all the necessary terms and definitions to support the pilot implementation needs. The result would be a list of terms that need to be added to BEDES, which can then be incorporated into the SEED Platform.

The pilots would also be used to identify and develop necessary supporting documentation and guides so that users can successfully implement BEDES and communicate their schemas and exchange protocols to others. The long-term goal, and measure of the success of BEDES, is that the BEDES Dictionary and Use Case Schemas meet the needs of and are widely implemented by a range of stakeholders.

Table 1 indicates four major stakeholder categories of potential early adopters.

Table 1: Potential early adopters of BEDES

Stakeholder Type	**Potential Early Adopters**
Exchange schemas	Home Performance XML Green Button HPXML BuildingSync
Software tools	Portfolio Manager Commercial Building Energy Asset Score Home Energy Score eProjectBuilder Non-profit and Private-sector software and databases
Standards	ASHRAE SPC 211 Real Estate Transaction Standard
Entities that collect or distribute data	California Energy Commission Cities with disclosure laws Home Performance with Energy Star City Energy Project partners

1. Exchange Schemas. Exchange schemas organize the terms into a structure for a specific use case. A given schema could be used as the import/export file format for many software programs. There are several organizations that have developed exchange schemas for specific use cases, and are also interested in being BEDES compliant. Some of these were used to develop BEDES, but determining the exact method for showing BEDES compliance will be part of the pilot phase of BEDES. For example:

- The Building Performance Institute's Standard for Home Performance-Related Data Transfer (HPXML) is very interested in being BEDES-compliant. The HPXML standard was used to develop BEDES, and the BEDES team should continue to work with them to finalize the official mapping. This strategy will allow software developers to continue to use the HPXML standard, as there will be a "translator" for a BEDES-compliant export and import file format.
- The BuildingSync commercial audit exchange standard recently published by the National Renewable Energy Laboratory is already BEDES-compliant by using BEDES terms. The BEDES team should continue to work with BuildingSync to maintain compliance as it evolves.

2. Software tools import and export information using a data schema. The BEDES team should work with pilot software tools to develop and use BEDES-compliant mapping and/or schemas. For example:

- The Commercial Building Energy Asset Score and eProjectBuilder are very interested in being BEDES-compliant, which will also advance the goal of promoting the use of BEDES within DOE-funded tools.

3. Standards. There are several standards that address the collection and use of building energy data. The BEDES team should work to incorporate BEDES terms into standards where feasible. For example:

- ASHRAE Standards Project Committee (SPC) 211. This standard for audits is currently in development and will likely include appendices for audit data collection forms. The committee is actively considering inclusion of a BEDES compliant data collection form as an informative appendix.

- The Real Estate Standards Organization has developed Real Estate Transaction Standard for reporting information about real estate transactions, and they want to include energy efficiency information such as found in BEDES terms and definitions.

4. Entities that collect or distribute data can establish what information should be collected, but do not necessarily have a set schema and are not software programs. They can require the use of BEDES terms, or if they have an existing set of terms, they can establish a mapping to BEDES. For example:

- **CEC & Schools**. Initial planning has started with the State of California Energy Commission for a pilot working with schools under AB 39. The State

recognizes the need for specifying, collecting, storing and analyzing the data from the numerous school districts that will be receiving funds for retrofit projects. One option under consideration is to map the relevant terms in the California's Standard Data Dictionary (SDD) to BEDES and use SEED for the reporting of energy data could facilitate the analysis and evaluation of these school energy retrofit projects.

These pilots should be supported as resources allow. It will be critical for the widespread adoption of BEDES to work with organizations to help them develop BEDES mappings and input/output formats. This may require funding support from DOE, as these organizations may not have the financial bandwidth to take this on by themselves. Toward that end, the BEDES team should work with each of these pilots to set goals for BEDES-compliant products, help develop BEDES-compliant mappings and schemas, and publish and disseminate these products.

Recommendation #5. Provide Maintenance and Updates

In the short term, there is a need for the existing DOE-supported BEDES implementation team to provide updates, and maintenance. However, the long-term vision for maintenance and updates of BEDES is of a separate organization that reviews, supports and promotes BEDES use.

Managing BEDES will entail undertaking the following tasks for its support, maintenance, and upgrades:

1. **Maintenance, error fixing, and periodic updates**. After the initial release of BEDES 1.0, there will need to be a process for providing maintenance, fixing user-identified errors, and periodic updates.

2. **User support (**in addition to the User Support task from # 4). Because BEDES is a reference for a diverse set of users, there will be a need for a mechanism for answering user questions about how BEDES is to be used, and what it can and cannot do, and reviewing new mappings and schemas. Users will have questions about Use Cases and other issues on functionality.

3. **Upgrades and future development**, e.g., BEDES 1.1 and BEDES 2.0. There are several features that could be added to future versions of BEDES. These include ways that users can share their own schema, as well as new use cases such as loan data, code compliance, simulation information, and others.

4. **Promotion and adoption.** There is a need for a plan to promote BEDES and engage market players. One scenario is that program implementers, such as cities, states, or utilities, would simply require BEDES for their programs and that this would be the primary mechanism for adoption.

5. **Education and Training.** There is a likely need that new users would benefit from education and training.

Updates to the BEDES Dictionary are currently envisioned on a twice a year schedule, while new mappings and use-case schemas, can be added on a rolling basis. Proposed updates for the BEDES Dictionary 1.0 are currently scheduled for March 2015 (BEDES 1.1) and September 2015 (BEDES 1.2). This schedule may be driven in part by results from the Pilot projects discussed earlier.

As noted previously, a major concern for BEDES updates is in the management of version control. The addition of new terms to the BEDES Dictionary should not be a cause for concern, but the changing of definitions will need to be managed carefully. All changes to definitions will need to be well documented, so that software implementers can be made aware of these changes and implement them in their software in advance of new releases.

The SWG also recommended a clear articulation of the boundaries of BEDES and the use cases that are currently supported versus those that are not. It was also agreed that the maintenance needs will be better defined and understood once BEDES is released and implemented by the early adopters.

Recommendation #6. Transition to a Non-Profit Organization

BEDES is currently supported by DOE and managed by Lawrence Berkeley National Laboratory (LBNL). The recommendation is that both BEDES and the SEED Platform move toward a self-supporting model, managed by a non-profit organization. The funding strategy could include, but is not limited to membership dues, fees for certifying mappings and compliance, paid technical support, etc. Examples of such models include the National Fenestration Rating Council, Green Button, The Kuali Foundation, Auto-DR and GridLAB-D, where groups combine their resources for mutual benefit. Appendix B provides a brief summary and links to these organizations.

Types of Organizations that could Host BEDES. We've identified different categories of entities that could host BEDES. These include:

1. **Non-profit organizations**. Several non-profits are active in energy efficiency research and advocacy and may have a mission-related interest in ensuring BEDES' success. However, there may be the need to develop a new non-profit organization, dedicated to promoting the use and exchange of building energy performance data. Green Button may be a good example of a federally funded activity that has spun off its own non-profit dedicated to the release and use of utility billing data. Another example and potential model for BEDES is the National Fenestration Rating Council (NFRC); which also had federal support initially, but is now a well-established non-profit that provides standard test procedures, ratings, and tools.

2. **Standards organizations**. While technical standard organizations are often themselves non-profit organizations, e.g., ASHRAE, ANSI, ASTM, ISO, they are designed to adopt standards, and rely on others to update and support the standards.

3. **For-profit organizations**. For-profit organizations, e.g., Google, Microsoft, have explored providing energy-efficiency services and products for residential and commercial buildings, and might see the benefit in leading an industry-hosted standard for data exchange. This option has not been explored.

4. **Universities**, several universities have active energy efficiency centers that might be interested in hosting BEDES e.g., CMU, ASU, UCD, etc.

5. **National Laboratories**. National Laboratories have a long history of developing and maintaining building energy databases and tools, and could host BEDES and support BEDES users. Labs that conduct work in this area include ORNL, NREL, PNNL, LBNL, NIST, and others.

6. **Federal Agencies**. Federal agencies such as DOE, EPA, GSA, DOD, Commerce, and many others, all have directives and policies to collect and analyze their building energy data. Many of these agencies have already developed building energy data dictionaries or glossaries, e.g., for RECS, CBECS, Portfolio Manager, which could

adopt and support BEDES. DOE has pledged to adopt BEDES across many of its programs to further facilitate the exchange and analysis of data.

To pursue the question of what type of organization could best host and maintain BEDES, an exercise of identifying potential criteria for evaluating organizations/entities for hosting BEDES identified the following criteria:

1. **Accessibility**: Will the group provide access to BEDES by all interested users?

2. **Support**: Does the group have financial resources to maintain BEDES and future updates?

3. **Neutrality**: Does the group have special interests that would prevent it from being fair and impartial or perceived as such?

4. **Expertise**: Does the group have domain knowledge to support BEDES?

5. **Stability**: Does the group have a stable organization with relatively low-turnover in staff and support?

6. **Flexibility & Adaptability**: How fast could the group update versions, and how easily could it expand new use cases?

7. **Promotion & Market Engagement**: Does the group have expertise and experience in market engagement?

We asked the SWG to apply these criteria to each of the proposed host groups, and following their recommendations, developed the following two scenarios:

Scenario #1. **Open-source hosting**. There was a great deal of support from the expert group for following an "open-source" model, in which the user community of building energy data practitioners and researchers would contribute their expertise and use cases, and the forum of users would determine best practices for updates and future functionality.

Scenario #2. **Hybrid model**. In this scenario, the Federal government would help launch a new non-profit organization, which would manage BEDES and facilitate the participation of the community discussed in scenario 1. Examples of this scenario include Green Button, which was developed by the National Institute of Standards and Testing (NIST) with support from the U.S. Department of Commerce, and then evolved into a non-profit. In this model there would be a very active user community that provides input, but it is managed by a central entity. The central entity would initially be DOE/LBNL, but would move to a more open structure as a non-profit model with membership and a governing board.

Our recommendation is that DOE should pursue this second option, and that during the next 2-3 years BEDES should continue to be supported by DOE and managed by the

BEDES Implementation team. While DOE support and involvement may continue for a longer period, increasingly diverse funding sources are needed to achieve the full scale of the BEDES vision and ensure long-term financial viability. The BEDES Implementation team should actively recruit, support and foster the BEDES Community, which will form the underpinnings of the BEDES effort in both the short and the long term.

Given the need to establish a SEED Platform foundation in the coming year, the recommendation is to convene, in early FY 2015, a combined BEDES and SEED stakeholder group, which will work to form the proposed non-profit foundation. The BEDES component of this group would identify the mission, objectives, and activities that are aligned with SEED but unique to BEDES.
Following the identification of the purpose for the SEED/BEDES Foundation, the group would draft the charter and bylaws, and identify and recruit prospective board members.

The SEED/BEDES Foundation would need to address the following for BEDES:

1. **Technical development and support**. Ensure quality control, provide technical support for compliance, updates, mappings, quality assurance, and other customer support, including maintenance of the BEDES website, etc.

2. **Compliance Certification.** Determine approach, process and procedures for compliance checking and certification.

3. **Deployment partners**. Develop partnerships with software developers, standards organizations, efficiency programs, consultants, etc.

4. **Fund Raising and Business Development**. Develop the business plan and the value proposition and market it to potential sponsors, e.g., IBM, Microsoft, Google, etc. Determine member fees and/or fees for service.

5. **Management**. Provide internal management and operations for the non-profit foundation. One task is to trademark the BEDES name and logo to retain legal control and use as a value proposition.

6. **Governance**. The advisory board and potential sub-committees, e.g., technical, finance, marketing, etc., and the distinct relationship between SEED & BEDES governance.

A recommendation was made to look at the California Commissioning Collaborative as a model. This collaborative has a two-tiered structure with a funding board and an advisory board. Another model mentioned was GridLab-D.

Recommendation #7. Support BEDES Becoming An Industry Standard

The ultimate goal for BEDES is to become the *de facto* industry standard for building energy data exchange. The BEDES Strategic Working Group explored the issue of whether to pursue the adoption of BEDES as an *actual* industry standard, e.g., ASHRAE, ANSI-ASTM, or ISO, and determined that it should be postponed to a later time. The short-term effort should be made to ensure that BEDES is used widely and evolves organically. It can be codified as a formal industry standard at a later date.

A technical standard is "an established norm or requirement about technical systems." Only one body in the U.S. can write national standards, the American National Standards Institute (ANSI). ANSI authorizes other Standards Developing Organizations (SDOs) to write standards for specific systems or industries. There are roughly 300 certified groups that write standards in the U.S., around twenty of which are large (ASHRAE, for example). Both ANSI and ASHRAE charge money for using their standards.

Official standards typically take a long time—often two to three years or more—to get consensus, which ANSI does not define as unanimity but instead a substantial majority.

SDO's must go through a certification process to receive ANSI recognition. Once an SDO has developed a standard, it must be reviewed every 5 years. Failure to review a standard within this timeframe can lead to revoking of the standard by ANSI. However, SDOs are free to change the standard more frequently if they wish. Standards must also be reviewed by another standards organization.

ANSI requires that there is no unreasonable financial burden to participate in standard making or to get a standard established. There are two processes to update a standard: Updating the whole standard, a process which can take up to 6 months, or providing continuous maintenance, in which smaller changes are considered individually as needed. This second option takes more work from the committee responsible for standards maintenance.

As background to this recommendation, the SWG did an exercise to delineate the pros and cons of turning BEDES into an ANSI or other industry standard. Below is the compiled list of pros and cons of BEDES becoming a formal standard from the SWG group exercise:

<u>Arguments for making BEDES an industry standard:</u>

1. A standard to reference provides greater credibility
2. A standard can provide increased rigor
3. A standard helps ensure complete/consistent information
4. A standard could enable certification and compliance

5. A standard gives everyone the ability to have input (but this could be achieved in other ways)
6. A standard may help the market move more quickly to adopt BEDES
7. A standard has a defined updating process (rather than ad hoc)
8. A standard allow laws and codes to reference the BEDES Standard
9. A standard creates a known refresh time that provides certainty to market players

Arguments for not making BEDES an industry standard:

1. The Dictionary alone may not qualify as a standard
2. A consensus process can "gum up the works"
3. A codified standard may deter an open source community
4. It is possible to enable certification and compliance without a standard
5. A standard is time consuming to update
6. Creating a standard would be premature
7. DOE has enough leverage to promote BEDES without a standardization process
8. Standard groups often want to charge—so users would have to pay to use
9. If over-specified it could constrain or deter third party software providers

Additional SWG Comments on BEDES becoming a Standard or not:

- May not have standard initially, but move to standard over time.
- Can reduce some of cons by selecting an appropriate standard body
- We may not have control over some entity requesting movement to code
- Should consider whether cons can be addressed either through standard or other means
- Understand milestones and process for becoming standard, so have head start and compatible with standard adoption process
- Is having to pay for it a show-stopper, or is there a work-around?
- Follow data standards adoption process (e.g., Oasis standard) rather than formal ANSI/ASHRAE standard process
- See if it is possible to address the cons to becoming a standard; and on the flip-side see if it is possible to capture the pros through a non-formalized standard process
- Use cases don't travel into the standards adoption process

Even though BEDES was called out in the 2015 Roadmap for New ANSI standards, the SWG recommended that it was premature at this time to pursue an ANSI standard. BEDES should evolve in the industry before the relevant BEDES organization pursues more formal standardization.

Appendix A: Members of the BEDES Technical Working Group and the BEDES Strategic Working Group

We owe an enormous debt to the members of the BEDES Technical Working Group and the BEDES Strategic Working Group, who provided critical feedback, valuable input, and thoughtful responses to our many queries and drafts. We want to acknowledge these individuals and organizations listed below:

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State of Wisconsin	Don Hynek
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Sustainable IQ	Kevin Settlemyre

Sustainable Real Estate Solutions	Brian Burstiner
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The Real Estate Roundtable	Duane Desiderio
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Appendix B: Examples of Federally Launched, Non-Profit Hosted Programs

National Fenestration Rating Council

The **National Fenestration Rating Council** (NFRC) is a non-profit organization that administers the only uniform, independent rating and labeling system for the energy performance of windows, doors, skylights, and attachment products. NFRC was formed in response to the energy crises of the 1970s.

To address concerns about energy consumption, the fenestration industry developed a host of new energy-efficient technologies, including low-e coatings, low-conductance spacers, and gas fills. Unfortunately, in advertising these new technologies some manufacturers made outlandish claims about the performance of their products. Consumers complained, and the federal government began to investigate.

By the late 1980s, industry stakeholders staved off confusion, federal intervention, and perhaps costly litigation by coming together in 1989 and founding NFRC to provide independent verification of product performance.
http://www.nfrc.org/about.aspx

Green Button Initiative

The **Green Button initiative** is an industry-led effort that provides utility customers with easy and secure access to their energy usage information in a consumer-friendly and computer-friendly format.

Green Button is based on the Energy Services Provider Interface (ESPI) data standard released by the North American Energy Standards Board (NAESB) in the fall of 2011. The data standards development process was facilitated by the Smart Grid Interoperability Panel, a public private partnership that is facilitated by the National Institute of Standards and Technology (NIST).

The ESPI standard consists of two components: 1) a common XML format for energy usage information and 2) a data exchange protocol which allows for the automatic transfer of data from a utility to a third party based on customer authorization. All of the utilities that have committed to Green Button will implement the common XML data format in an easy to download manner.

The Green Button initiative was officially launched in January 2012. To date, a total of 35 utilities and electricity suppliers have signed on to the initiative. In total, these commitments ensure that 36 million homes and businesses will be able to securely access their own energy information in a standard format. This number will continue to

grow as utilities nation-wide voluntarily make energy data more available to their customers in this common, machine-readable format.

http://energy.gov/data/green-button

OpenADR Alliance

The **OpenADR Alliance** was formed in 2010 by industry stakeholders to build on the foundation of technical activities to support the development, testing, and deployment of commercial OpenADR and facilitates its acceleration and widespread adoption. This approach needs to engage service providers (such as electric utilities and systems operators) within the domain of the Smart Grid that publish OpenADR signals, as well as the facilities or third-party entities that consume them to manage electric loads.

The OpenADR Alliance will enable all stakeholders to participate in automated DR, dynamic pricing, and electricity grid reliability. The OpenADR Smart Grid standard uses existing standards from OASIS, UCA and NAESB.
http://www.openadr.org/about-us

GridLAB-D

GridLAB-D™ is a new power distribution system simulation and analysis tool that provides valuable information to users who design and operate distribution systems, and to utilities that wish to take advantage of the latest energy technologies. It incorporates the most advanced modeling techniques, with high-performance algorithms to deliver the best in end-use modeling. GridLAB-D™ is coupled with distribution automation models and software integration tools for users of many power system analysis tools.

GridLAB-D™ was developed by the U.S. Department of Energy (DOE) at Pacific Northwest National Laboratory (PNNL) under funding for Office of Electricity in collaboration with industry and academia.
http://www.gridlabd.org/