In the administration of a home energy upgrade program, working with standard data may sound like a nice goal, but not crucial to day-to-day operations. Nothing could be further from the truth! As the late management guru Peter Drucker wrote, "What gets measured gets managed." Program administrators depend on being able to efficiently obtain reliable, timely, and accurate data to make decisions that impact a program's operations, from tracking projects and processing rebates to quality assurance and measuring energy savings or progress toward other program goals.

Contractor Software Training

Data standards like the Home Performance Extensible Markup Language (HPXML) establish a common way of defining, formatting, exchanging, and using data to describe residential buildings, energy conservation measures, and energy performance. This data may come from multiple sources – contractors, utility companies – and be used for different purposes in the administration of a program. In larger programs that serve hundreds of homes, thousands of data points may be collected and managed per year, representing a significant cost if data cannot be easily aggregated, shared, and analyzed. Without data standardization, administrative tasks like verifying, sharing, and processing data will be more costly and labor intensive.

Contractors working with programs also benefit from the implementation of data standards. HPXML enables contractors to export data to programs regardless of vendor or organizational boundaries. This reduces costs associated with data collection and reporting, especially for contractors working with multiple programs. Because data is standardized, programs can implement automated data checks on incoming HPXML files, enabling contractors to provide customers with immediate feedback on project and incentive eligibility. A commitment to HPXML demonstrates a commitment to minimize the administrative burden on contractors.

A Closer Look at HPXML

HPXML is a data standard created by a diverse group of stakeholders to support the growth of the residential energy efficiency industry by facilitating communication and the exchange of information and data on residential building and energy performance.

HPXML is comprised of two open data standards published by the Building Performance Institute (BPI), a nonprofit, ANSI-accredited standards-setting organization for the residential energy efficiency industry. BPI-2200-S-2013 *Standard for Home Performance-Related Data Collection* is a dictionary of terms used in the administration and evaluation of home energy upgrades. This standard is aligned with the U.S. Department of Energy's (DOE) Building Energy Data Exchange Specification (BEDES), a common set of data terms, definitions, and field formats that can be used by public and private sector software tools, data schemas, and databases within the commercial and residential buildings sector. HPXML is the most widely-used implementation of residential BEDES.

The second standard, BPI-2100-S-2013 *Standard for Home Performance-Related Data Transfer* is a schema (model or outline) for data transfer using XML (an extensible markup language that defines a set of rules for encoding documents in a format that is both human-readable and machine-readable). This standard enables software developers to create or parse HPXML files. HPXML becomes a foundation for interoperable data exchange between computer systems that enables programs to reduce costs through automation and the reuse of data and software for multiple purposes.

Below is an example of an **HPXML** file that may be transmitted from energy audit software to a program administrator's software. The lines below describe a natural gas storage water heater in conditioned space. The labels in brackets <> provide a standard way to markup data about a home so that it can be exported from one computer software and imported into another computer software without much manual data entry and processing.

```
<WaterHeatingSystem>
    <SystemIdentifier id="dhw1"/>
    <FuelType>natural gas</FuelType>
    <WaterHeaterType>storage water heater</WaterHeaterType>
    <Location>conditioned space</Location>
    <CombustionVentingSystem idref="combvent1"/>
</WaterHeatingSystem>
```

How do data standards, like HPXML, benefit home energy upgrade programs?

HPXML is NOT a substitute for setting program goals, benchmarking metrics, or identifying appropriate data to measure against benchmarks.[1] Data standards are a means of promoting the efficient sharing of data among programs, contractors, implementers, and other market actors that benefit from access to data on a home's energy efficiency features and performance. When a program uses HPXML-compliant software, it can more easily automate data processing steps, and reduce time and costs associated with manual data entry and review.

For example, from 2013 to 2016, Build It Green streamlined the rebate application review process for Pacific Gas & Electric's Energy Upgrade California program, reducing the number of steps and databases used in the process from eight and five to five and two, respectively. Data standardization using HPXML was one of the action steps that made it possible to reduce a time-intensive, error-prone manual data transfer and mapping steps resulting in better quality data with less effort.[2]

For home energy upgrade programs in particular, HPXML enables programs to utilize software tools in the market at a lower cost (as opposed to building a tool from the ground up) because software companies have already made the initial investment in the standard. This means that programs using HPXML-compliant program management software can accept data from multiple energy audit tools because these tools are exporting files in standard HPXML format. Contractors can choose the tool that best meets their business needs, and potentially reduce costs associated with purchasing and learning program-specific software.

In areas where the software market has been opened through use of HPXML, contractor satisfaction with the program increased. For example, the electric utility Arizona Public Service (APS) and its Home Performance with ENERGY STAR® program sponsor, FSL Home Energy Solutions, implemented HPXML in part to give contractors a choice of energy audit tools. Because contractors were collecting and sending standard data to the program, APS was able to automatically validate data against different program eligibility criteria to improve the quality and accuracy of data. Contractors decreased administrative labor by 31 percent per project following the implementation of the HPXML software environment, and their satisfaction with the program increased by 50 percent.[3]

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[1] Guide for Benchmarking Residential Energy Efficiency Program Progress with Examples
[2] Streamlining Processes to Achieve More for California Home Upgrade Program, 2018
[3] Case Study: Improving Arizona Home Performance, 2016

U.S. DEPARTMENT OF ENERGY

When should my program adopt HPXML?

Integrating HPXML into existing software and program tracking systems can be challenging, but there are a few key opportunities in a program's implementation cycle that can make the transition easier and less costly.

A good time to adopt HPXML is when a program issues a solicitation for a new implementation contractor or program management software. For example, in 2017 the Delaware Sustainable Energy Utility (DESEU) issued a Request for Qualifications (RFQ) for a new Home Performance with ENERGY STAR and Home Energy Check Up Program Implementation contractor.[4] In the RFQ, DESEU required that the implementation contractor support a transition to an open modeling software platform that is HPXML compliant. The New York State Energy Research and Development Authority (NYSERDA) is another example. In 2017 NYSERDA issued a Request for Proposals (RFP) for new program management software that specified the use of HPXML. Stating a program's specifications in an RFQ or RFP is a key step in prioritizing data standardization.

The New York State Energy Research and Development Authority (NYSERDA) went through a process of implementing HPXML for its Home Performance with ENERGY STAR program from 2016 to 2018. In 2017, NYSERDA issued a Request for Proposals (RFP) for new program management software. The RFP included:

Definitions for Technical Terms such as HPXML:
The Home Performance Extensible Markup Language (HPXML) is an open data standard created to support the home performance industry by facilitating communication and the exchange of information and data on residential building and energy performance. More information can be found at: http://www.hpxmlonline.com.

A Scope of Services to be Provided such as:
- *Generation of documents and forms for Participating Contractor and Program Participants including output of information collected in or calculated by the system and HPXML data fields.*
- *Data capturing and analysis capabilities that are compatible with HPXML.*
- *Capability to leverage HPXML data standard, or other alternate methods, to support logic-driven and automated decision-making for program project approvals.*

Project Types and Typical Lifecycle such as:
A system that can receive HPXML output from the approved energy modeling tools, parse the HPXML files, and use logic for automated decision-making to reduce the need for manual reviews. NYSERDA estimates approximately 15,800 home performance jobs, among all income levels, in 2017. With the implementation of HPXML data standard for auto decision-making, it expected that 80 percent of projects could be reviewed through the system automatically.

Where can I find more information about HPXML?

HPXML is maintained by a national working group of stakeholders that use it, including organizations and individuals from residential energy efficiency programs, software development, government, home performance contracting, and the nonprofit sector. The HPXML working group is chaired by the Home Performance Coalition (HPC) and follows an open and consensus-based decision-making process with oversight from the BPI Data and Modeling Standards Technical Committee. The working group meets quarterly to discuss updates and to vote on new versions of the standards. Membership and participation in the HPXML working group is voluntary and open to all organizations and individuals interested in HPXML.

HPXMLonline.com provides information about HPXML. It is maintained by HPC to support the development and implementation of HPXML, and includes links to the HPXML Implementation Guide, HPXML Developers Toolbox, data collection templates, data standards, and more.

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[4] DESEU Request for Qualifications for Home Performance with ENERGY STAR with Complimentary Home Energy Check Up Program Implementation Contractor, 2017