

National Residential Efficiency Measures Database

Guide for Application Developers

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Executive Summary

This document provides guidance to users of the National Residential Efficiency Measures Database, sponsored by the U.S. Department of Energy (DOE) Office of Energy Efficiency and Renewable Energy (EERE). The database project is being developed and maintained by the National Renewable Energy Laboratory (NREL).

The genesis of the project was to integrate several existing DOE databases of building retrofit measures and costs into a unified national database. The resulting integrated database contains regularly updated and expanded information about the performance parameters and costs of residential retrofit technologies that improve the energy efficiency of residential buildings. This information is made available to all DOE projects and to the public in a standardized format.

This document provides guidance to users and application developers utilizing data from the database. It contains a detailed description of data and instructions for exporting data from the database.

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1 Introduction

1.1 Purpose

This document provides specifications and instructions that facilitate using the National Residential Efficiency Measures Database, sponsored by the U.S. Department of Energy (DOE). The database project is being designed and developed by the National Renewable Energy Laboratory (NREL).

1.2 Intended Audience

This document is intended for software application developers and other users of the database. It provides instructions and details useful to those utilizing the database contents in other applications.

1.3 Contact Information

The database is being developed at the National Renewable Energy Laboratory:

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1.4 Background

The focus of this project is to provide regularly updated performance parameters and associated estimated costs of retrofit technologies that improve the energy efficiency of residential buildings. In order to support external building science R&D organizations, ensure technical accuracy, and enhance government transparency, this information is available to all DOE projects and to the public in a standardized format. NREL hosts the database and coordinates the update process.

Figure 1 shows the overall concept for the project.

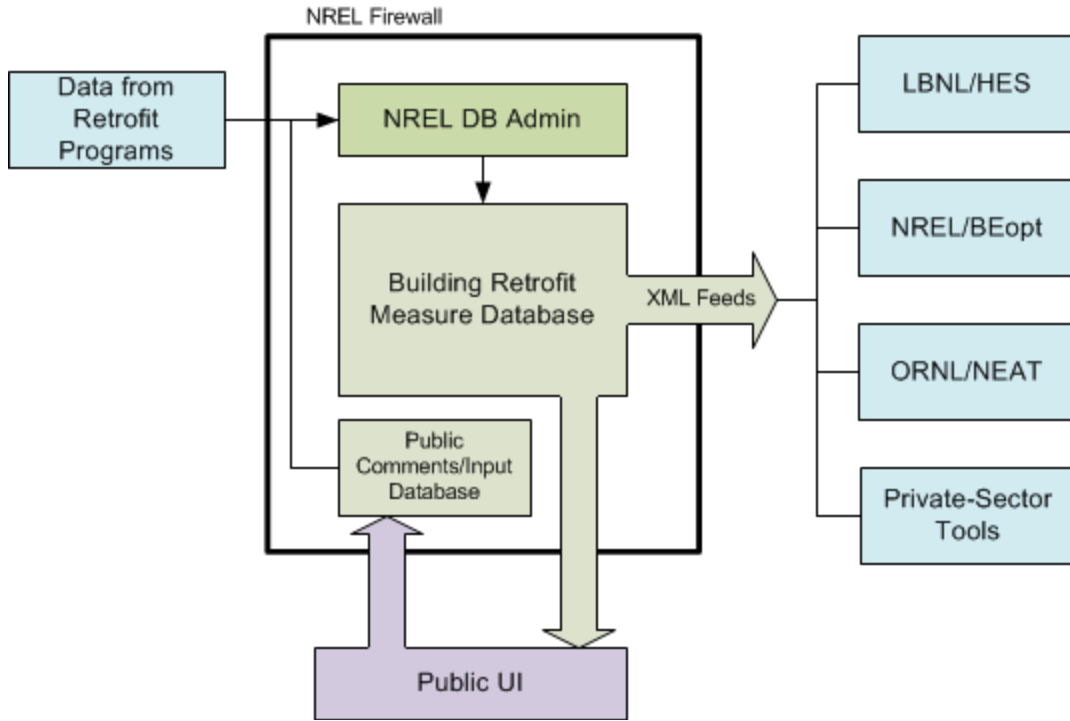


Figure 1. Overall project concept.

2 Database and Data

2.1 Overview

The retrofit measure database is comprised of two basic objects: *Components* and *Actions* (see Figure 2 and Figure 3). These are combined to create *Measures*, which consist of a before-*Component*, an after-*Component*, and an *Action* to move from before to after (see Figure 4). *Components* (i.e., materials) have *Properties*, *Lifetimes*, *Costs*, and *Cost Drivers*; *Actions* (i.e., labor) have *Costs* (see Figure 5).

NREL has constructed, and made available via the web interface and XML feed, a measure set from these objects. Each retrofit measure has *Components* and *Actions* associated with it. A *Component* provides the physical description of a particular building or system element including, but not limited to, any properties that affect the energy use of the home and the expected useful life of the measure. The database is designed to accommodate an unlimited number of *Properties* and *Costs* for a *Component* and unlimited number of *Costs* for an *Action*. At this time there are three *Cost* records for each *Component* and each *Action*. These costs reflect the mean, 10th percentile and 90th percentile of the raw costs collected and processed for the database. *References* can be assigned to *Components*, and *Actions*. At this time there are no *References* in the database, but anticipated examples of *References* include best practice instructional documents, case studies, datasheets, etc.

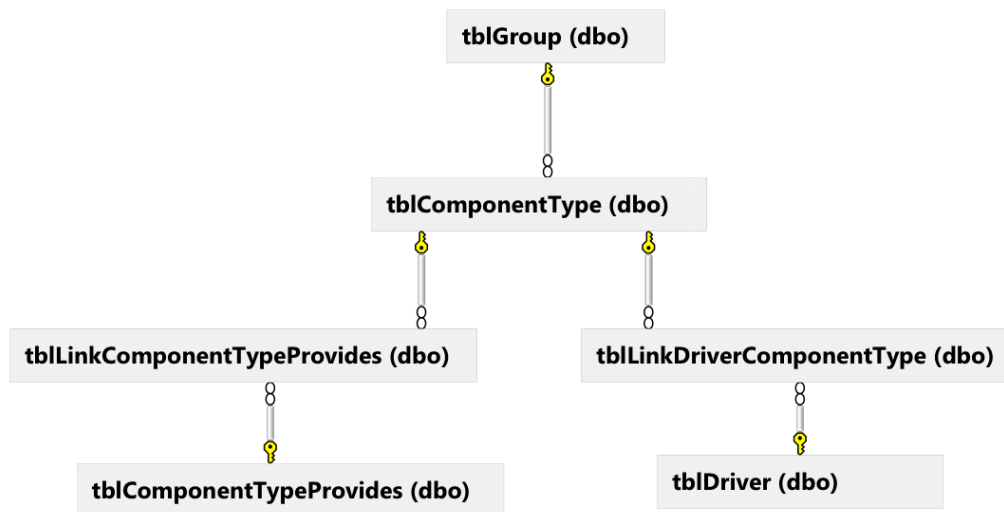


Figure 2. Detailed database schema overview: Components.



Figure 3. Detailed database schema: Components/Actions.

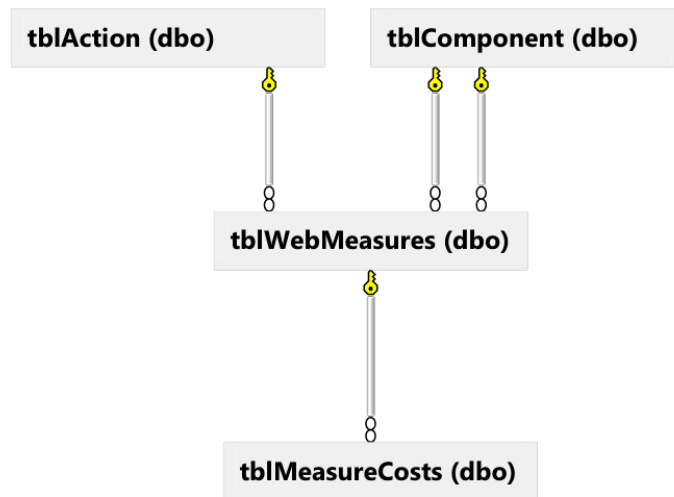


Figure 4. Database schema overview: Measures.

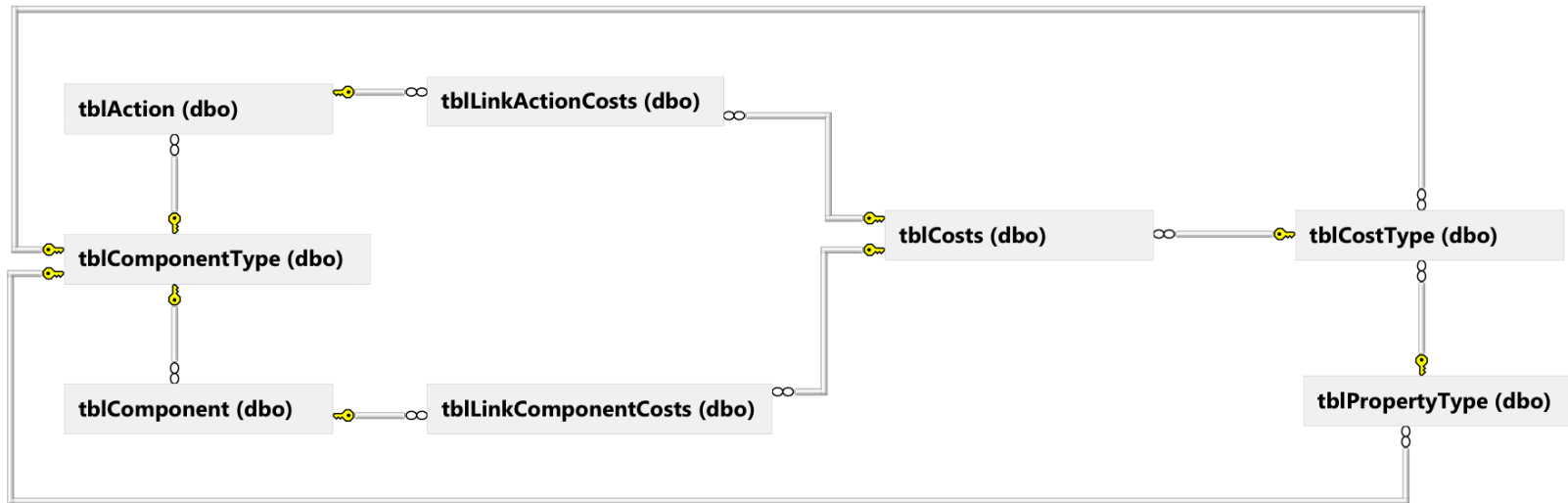


Figure 5. Detailed database schema: Component/Action costs.

2.2 Field Descriptions

A data dictionary is available via the database website using the following uniform resource locator (URL):

http://www.nrel.gov/ap/retrofits/data_dictionary.cfm

A sample of the data dictionary is shown in Figure 6

Data Dictionary			
This page features the data dictionary for the National Residential Efficiency Measures Database, which supplies users with information about the database organization such as table structure, field names, and data element type and length.			
tblAction			
Column name	Data type	Length	Description
ActionID	int	4	Primary key for actions
sName	varchar	255	Action name
idComponentTypeID	int	4	The component type to which this action may be applied (foreign key)
idActionTypeID	int	4	The action type that this action belongs to (foreign key)
dEntryDate	datetime	8	Date the action was created/entered
sNotes	varchar	4000	Additional notes about the action
tblActionComponentFilter			
Column name	Data type	Length	Description
ActionComponentFilterID	int	4	Primary key for action component filters
idActionID	int	4	Action which this filters components for (foreign key)
idPropertyTypeID	int	4	Which property type to use in the filter (foreign key)
isAfterComponent	bit	1	1 if the filter applies to the after component, 0 if it applies to the before component
isEqual	bit	1	1 if the property value is to be equal to, 0 if it is to be not equal to
sEqualsValue	varchar	50	The value of the property to filter based on
tblActionType			
Column name	Data type	Length	Description
ActionTypeID	int	4	Primary key for action type
sDescription	varchar	255	Short text description of the action type
nBeforeMultiplier	int	4	Multiplier on the before component cost used in determining measure cost
nAfterMultiplier	int	4	Multiplier on the after component cost used in determining measure cost
tblComponent			
Column name	Data type	Length	Description
ComponentID	int	4	Primary key for component
sName	varchar	255	Name of the component
idComponentTypeID	int	4	What component type this component belongs to (foreign key)

Figure 6. Snippet from data dictionary available via database website.

2.3 XML Feeds

Two database content XML feeds are provided – one provides the data organized into the pre-defined measures displayed in the UI; the second feed provides the data organized per the underlying database schema. The measure-centric feed is larger because the data are organized in a hierarchal manner, and data are repeated as they are used in multiple measures. In the second XML feed, organized by data table, data are only included once.

In addition the XML feeds, the XML schemas are provided as XSD files. These files provide the schemas in W3C XML format. The XML and XSD feeds can be accessed using the following URL:

http://www.nrel.gov/ap/retrofits/data_disclaimer.cfm

When using a web browser to access the XML, the data can be saved to a file by utilizing the *Save As* command in the browser application.

Figure 7 shows schematically the XML schema for the measure-centric XML feed. A snippet of the measure-centric XML feed is shown in Figure 8.

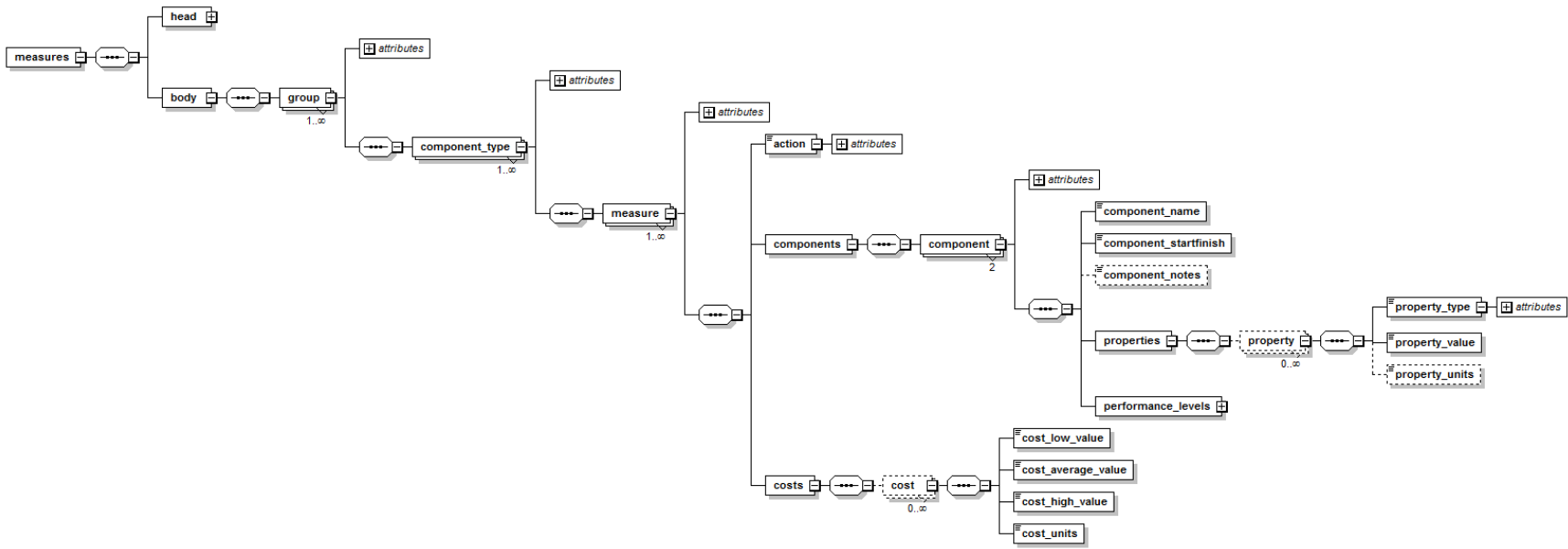


Figure 7. Measure-centric XML feed schema overview.

```

- <measures>
- <head>
  <title>National Residential Efficiency Measures Database</title>
  <creation_date>2013-03-07</creation_date>
  <version>3.0.0</version>
  <version_description>Public Release</version_description>
  <xml_schema_version>v3.0.0</xml_schema_version>
  - <source>
    <moreinformation>http://www.nrel.gov/ap/retrofits/</moreinformation>
    <disclaimer>http://www.nrel.gov/ap/retrofits/disclaimer.cfm</disclaimer>
    <credit>National Renewable Energy Laboratory</credit>
    <feedback>http://www.nrel.gov/ap/retrofits/comments.cfm</feedback>
  </source>
</head>
- <body>
- <group id="12" name="Walls">
  - <component_type id="184" name="Wood Stud">
    - <measure id="30195">
      <action action_type_id="4" id="703">Insulate with Loose Fill through Exterior (Non-Brick)</action>
      - <components>
        - <component id="2015">
          <component_name>Uninsulated, 2x4, 16 in o.c.</component_name>
          <component_startfinish>before</component_startfinish>
          - <properties>
            - <property>
              <property_type id="123">Cavity Depth</property_type>
              <property_value>3.5</property_value>
              <property_units>in</property_units>
            </property>
            - <property>
              <property_type id="92">Framing Factor</property_type>
              <property_value>0.25</property_value>
              <property_units>frac</property_units>
            </property>
            - <property>
              <property_type id="93">Stud Size</property_type>
              <property_value>2x4</property_value>
              <property_units>in x in</property_units>
            </property>
          </properties>
        </component>
      </components>
    </measure>
  </component_type>
</group>

```

Figure 8. Measure-centric XML snippet.

3 Additional Information

3.1 Component Properties

Not all applications will require or utilize all properties associated with a component. For example an application may utilize air-conditioner SEER or it may use COP coupled with performance curve coefficients. The application developer will need to determine which data are meaningful and useful for their application.

3.2 Costs

Cost data may be provided in a variety of formats. In some cases the cost is total cost for the measure, but in other cases it could be normalized by surface area, equipment capacity, etc. In some cases there may be multiple cost records that will need to be processed to obtain the total cost for the measure. For example, a constant cost and a normalized cost. Developers should check *CostUnits* to determine if the cost can be used directly or if it needs to be scaled and/or totaled appropriately for the measure.

3.3 Other

Additional details and background information can be found in the *Development Document*. This includes sources and calculation of measure costs, rules utilized to generate the measure set present in the UI and measure-centric XML feed.