Ex Ante Data Structure

This document describes a number of the tables in the ex ante database and provides guidance on how to define and reference the Implementation table to support time-dependent cost-effectiveness values.

Measure Definitions and Measure Qualifiers

Measure definitions describe the specific technologies associated with a measure, including the pre-existing technology, the code or standard technology that would be the normal replacement and the measure (or high efficiency) technology. The measure definition also links to a set of energy impact records, which may vary by location, building type, vintage and HVAC type.

In the DEER2011 database, each measure definition is linked to a set of energy impacts via the `Measure.EnergyImpactID` field. All energy impact records with:

`EnergyImpact.EnergyImpactID = Measure.EnergyImpactID`

are associated with the measure definition. Energy impact scaling factors may also be associated with the measure, depending on how the measure is defined.

With the DEER2014 update, identified as the "exante2014" database on deeresources.net and accessible via READI, multiple sets of energy impacts can be associated with one measure definition. The main motivation for this change is the multiple occupancy sensor scenarios that can be associated with the many commercial lighting measures. A "qualifier" field was added to the measure definition to associate an occupancy sensor scenario and scenario-specific energy impacts to the measure. For many commercial lighting measures in DEER2014, three occupancy sensor scenarios are associated with the measure, a default "building-wide" occupancy sensor scenario, an "all-spaces" occupancy sensor scenario and a "no occupancy sensor" scenario.

The following capture of the measure tab of READI shows how the qualifier is used to select the associated energy impacts in the exante2014 and exante1314 databases.

Figure 1. Measure Qualifiers in READI

With the combined DEER2011 & DEER2014 database (exante1314), the qualifier is also used to associate different eras of energy impacts to a measure definition. HVAC measures that are common to DEER2011

and DEER2014, for example, have energy impacts associated with them based on both 2008 and 2013 Title-24 weather data.

Within the DEER database the Measure table is linked to the EnergyImpact table via the "Measure Qualifier" table (MeasQual). The `Measure.Qualifier` field links to the `MeasQual.MeasQualGroup` field in order to associate all of the relevant qualifiers to the measure.

The table below shows the contents of the `MeasQual` table in the exante1314 database:

MeasQualifierGroup	MeasQualifier	EnergyImpactID	StartDate	ExpiryDate	Version
DEER1314	DEER_for_2013		2013-01-01	2014-06-30	DEER2011
DEER1314	DEER_for_2014		2014-07-01		DEER2014
DEER1314-Ltg-Com-CFL	DEER_for_2013	Com-lltg-dWatt-CFL	2013-01-01	2014-06-30	DEER2011
DEER1314-Ltg-Com-CFL	2014_Bldg_OS	Com-lltg-dWatt-CFL_OSbldg	2014-07-01		DEER2014
DEER1314-Ltg-Com-CFL	2014_AllSpc_OS	Com-lltg-dWatt-CFL_OSspc	2014-07-01		DEER2014
DEER1314-Ltg-Com-CFL	2014_No_OccSens	Com-lltg-dWatt-CFL_OSnone	2014-07-01		DEER2014
DEER1314-Ltg-Com-LF	DEER_for_2013	Com-lltg-dWatt-LF	2013-01-01	2014-06-30	DEER2011
DEER1314-Ltg-Com-LF	2014_Bldg_OS	Com-lltg-dWatt-LF_OSbldg	2014-07-01		DEER2014
DEER1314-Ltg-Com-LF	2014_AllSpc_OS	Com-lltg-dWatt-LF_OSspc	2014-07-01		DEER2014
DEER1314-Ltg-Com-LF	2014_No_OccSens	Com-lltg-dWatt-LF_OSnone	2014-07-01		DEER2014

Table 1. MeasQual table contents

In this table, there are three measure qualifier groups (identified in the first column) that can be associated with a measure via the `Measure.Qualifier` field: DEER1314, DEER1314-Ltg-Com-CFL, and DEER1314-Ltg-Com-LF. Each group has a number of measure qualifiers and supporting data that are joined to the Measure table via the measure qualifier group.

Note: the individual measure qualifiers are described in the "MeasQualDesc" table in the database, accessible through READI in the Measure Definition group of the Support Tables tab.

With the combined database, EnergyImpact records are associated with measures via the EnergyImpactID **and** Version fields, such that all energy impact records with:
```
EnergyImpact.EnergyImpactID = Measure.EnergyImpactID
EnergyImpact.Vesion         = Measure.Version
```
are associated with the measure definition.

The following diagram show how EnergyImpact records are associated with an Implementation record when both the MeasureID and MeasEnQual fields are specified in the Implementation definition.

Implementation Table

ImplementationID
PA
MeasureID
MeasEnQual
…
Etc.

Measure Table

MeasureID
EnergyImpactID
Version
StdScaleVal
PreScaleVal
MeasDesc
StdDesc
Qualifier
…
Etc.

EnergyImpact Table

EnergyImpactID
Version
EnergyImpactID
Qualifier

Etc.

MeasQual Table

MeasQualGroup
MeasQualifier
EnergyImpactID
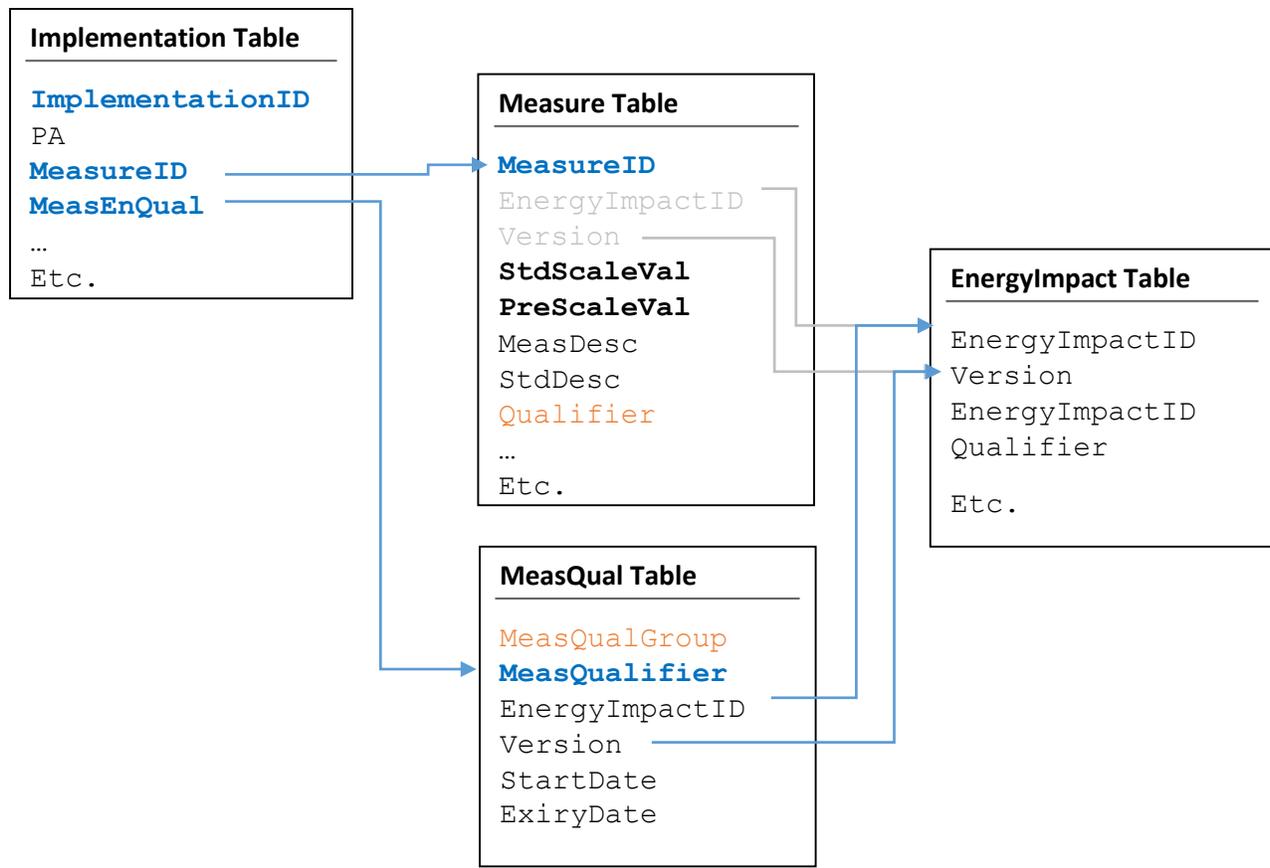Version
StartDate
ExiryDate

Figure 2. Joining EnergyImpact rows when an Implementation specifies both the MeasureID and Measure Qualifier

Rules associated with linking the Implementation, Measure and EnergyImpact tables:

- If the MeasEnQual value is not specified in the Implementation table, the EnergyImpactID and Version fields in the Measure table are used to join the EnergyImpact table for measures that have no MeasQualifierGroup specification. For Measures that do have associated MeasQualifier values, the Implementation will link EnergyImpacts for all StartDate/ExpiryDate periods.
- If a MeasEnQual value is specified in the Implementation table, the EnergyImpactID and Version fields from the MeasQual table are used to join the EnergyImpact table, along with any relevant scale values from the Measure table.
- If the MeasQual.EnergyImpactID or the Version fields are not specified for a given MeasQualifier, the values specified in the Measure table are used.
- Only MeasQualifiers that are associated with a measure definition (via the Measure.Qualifier and MeasQual.MeasQualGroup fields) can be specified in the Implementation table for a given MeasureID.

Measure Energy Impacts table (MeasEnImp)

The measure energy impacts table in the exante1314 database is the product of linking all energy impact records to all applicable combinations of measures and measure qualifiers and applying measure scale

values when appropriate. The table includes all possible energy impacts that can be claimed for the given measures and measure qualifiers. Figure 3 shows how the MeasEnImp table is created. The table is provided in the ex ante database as a shortcut to lookup energy impacts as a function of a given MeasureID and Qualifier without having to link to the MeasQual and EnergyImpact tables and without having to apply the measure scale values to the energy impacts.
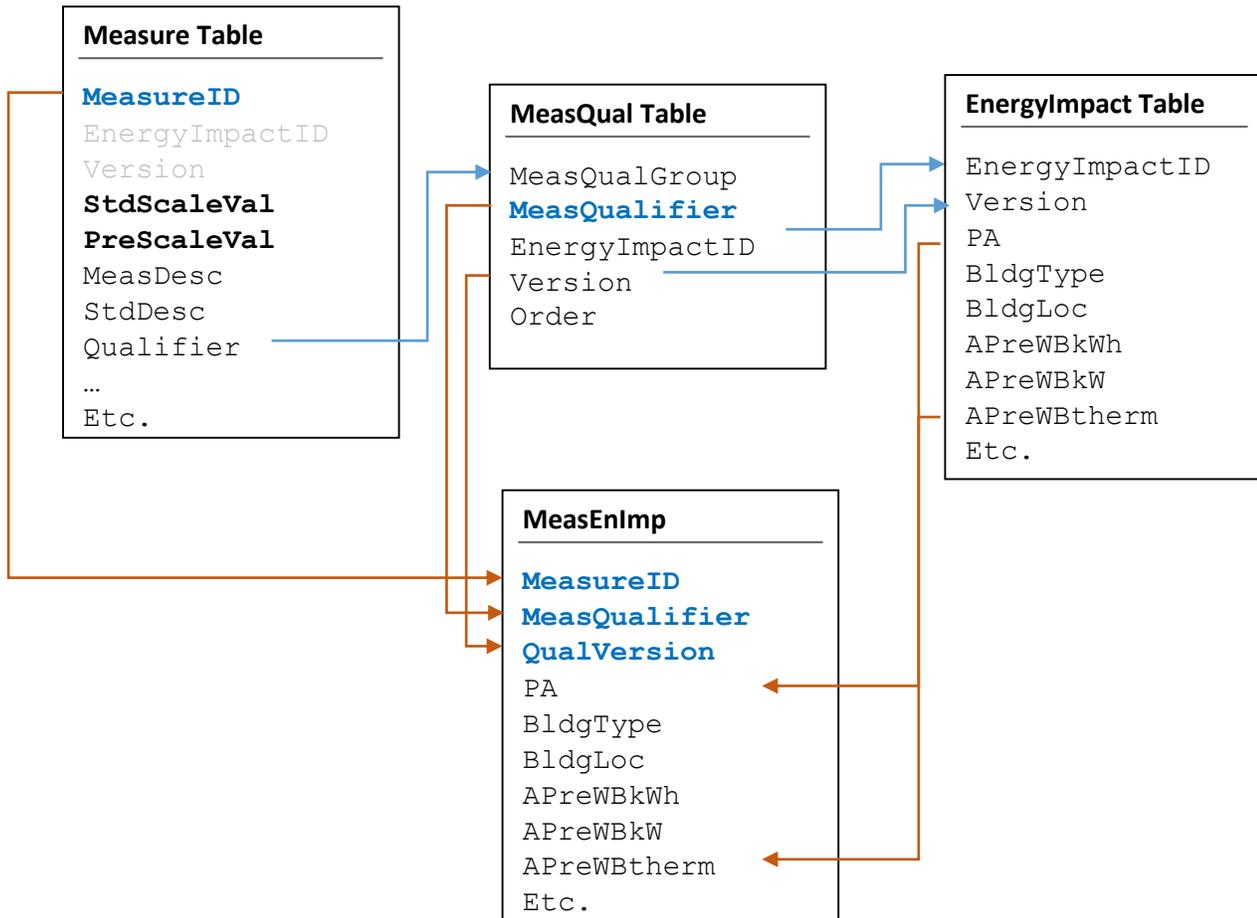

Figure 3. The data sources for the Measure Energy Impact table

In the measure energy impacts (MeasEnImp) table, the MeasureID field value comes from the MeasureTable; the MeasQualifier and QualVersion field value comes from the rows of the MeasQual table that are linked to the Measure table (`Measure.Qualifer = MeasQual.MeasQualifier`) and the remaining applicability and energy impact field values come from the linked EnergyImpact table field values.

Developing and Referencing Measure Implementations with Time-dependent cost-effectiveness values

The ex ante data structure, as documented in the file "ex_ante_specification_20140401.accdb", includes the ability to define measure Implementations that link to cost-effectiveness datasets that vary based on a referenced date value. This feature allows the same reference to an ImplementationID to result in different cost-effectiveness values depending on when a measure is installed or completed. The following table lists the Implementation table fields that are related to this time-dependence:

Field name	Description
ImplementationID	Main identifier for the cost record
StartDate	First date this record is applicable
MeasureID	Measure ID
MeasQualifier	Measure Qualifier
GSIA_ID	Gross-savings and Installation adjustment ID
NTG_ID	Net-To-Gross ID
MeasCostID	Measure technology Cost ID
StdCostID	Code/Standard technology Cost ID

Table 2. Implementation table fields related to Time-Dependence

A specific ImplementationID (along with other primary key data) may be assigned to multiple records, so long as each record has a different value in the StartDate field. The associated cost-effectiveness values will differ based on one of the other fields listed above also changing. Typically, the measure energy impact qualifier (MeasEnQual) or the MeasureID will change, but the assigned gross savings and installation adjustment (GSIA_ID), net-to-gross record (NTG_ID) or cost fields may also change.

In the following example, the "measure qualifier" (MeasQualifier) and the measure technology cost reference change between the two implementation records along with the StartDate. Implementations referenced with a date after January 1st 2013 but before July 1st, 2014 will associate the "DEER_for_2013" measure energy qualifier and the 2013 measure technology cost record with the measure ID while the same Implementation referenced with a date after June 30th, 2014 will associate the "DEER_for_2014" measure energy qualifier and the 2014 measure technology cost with the measure ID.

Example Implementation Record fields: A

```
ImplementationID    = HV-15tonPkgAC-11.5EER
StartDate           = 1/1/2013
MeasureID           = NE-HVAC-airAC-SpltPkg-135to239kBtuh-11p5eer
MeasQualifier       = DEER_for_2013
MeasCostID          = HV-15tonPkgAC-11.5EER-2013
StdCostID           = HV-15tonPkgAC-10.8EER-2013
```

Example Implementation Record fields: B

```
ImplementationID     = HV-15tonPkgAC-11.5EER
StartDate            = 7/1/2014
MeasureID            = NE-HVAC-airAC-SpltPkg-135to239kBtuh-11p5eer
MeasQualifier        = DEER_for_2014
MeasCostID           = HV-15tonPkgAC-11.5EER-2014
StdCostID            = HV-15tonPkgAC-10.8EER-2013
```