**OVERVIEW**

**OF**



Version 2.0

November 3, 2014

**ACKNOWLEDGEMENTS**

This document was produced by the combined efforts of the following companies and individuals.

Funded by: AEP Texas Central Company and AEP Texas North Company

CenterPoint Energy Houston Electric, LLC

Oncor Electric Delivery Company LLC

Texas-New Mexico Power Company

Drafted by: Mary Zientara, Guernsey

Ben Rankin, EnerNex

Rick Wornat, EnerNex

Reviewed by: Andrea O’Flaherty-Brown, Smart Meter Texas PM

Jeff Stracener, AEP Texas Central Company and AEP Texas North Company

Denny Daugherty, AEP Texas Central Company and AEP Texas North Company

Robert Frazier, CenterPoint Energy Houston Electric, LLC

Donny Helm, Oncor Electric Delivery Company LLC

Ronnie Pucket, Oncor Electric Delivery Company LLC

Bobby Roberts, Texas-New Mexico Power Company

Christine Wright, Texas Public Utility Commission

Alan Rivaldo, Texas Public Utility Commission **Table of Contents**

[1 Introduction 4](#_Toc371079603)

[2 Background and Context 5](#_Toc371079604)

[2.1 Texas Electric Market 5](#_Toc371079605)

[2.2 SMT Development History 5](#_Toc371079606)

[2.3 SMT and National Smart Grid Standards Development 6](#_Toc371079607)

[2.4 Maturing SMT Operations and Oversight 7](#_Toc371079608)

[3 Methodology 9](#_Toc371079609)

[3.1 AMIT Meeting Attributes and Design Process 9](#_Toc371079610)

[3.2 Identifying Business Processes 9](#_Toc371079611)

[3.3 Creating Context Diagrams 10](#_Toc371079612)

[3.4 Developing Business Requirements 10](#_Toc371079613)

[3.5 SMT Deployment and Operations 10](#_Toc371079614)

[4 SMT Functionality 15](#_Toc371079615)

[4.1 Overview 15](#_Toc371079616)

[4.2 Data Repository 15](#_Toc371079617)

[4.3 Data Access 16](#_Toc371079618)

[4.4 User Interfaces 17](#_Toc371079619)

[4.5 Third Party Access 17](#_Toc371079620)

[4.6 HAN Functionality 17](#_Toc371079621)

[4.7 Education 18](#_Toc371079622)

[5 Security 19](#_Toc371079623)

[6 Use of Industry Standards 20](#_Toc371079624)

[7 Appendix: ‘Understanding Smart Meter Texas’ Table of Contents 21](#_Toc371079625)

# Introduction

Smart Meter TexasTM (SMT) is an interoperable smart grid solution that stores usage data in increments of 15-minute intervals recorded by digital electric meters (commonly known as “smart meters”), and provides secure access to that data to customers and market participants (including through the use of a “Green Button”). In addition to acting as a common interface for access to smart meter data, SMT enables secure communications with customer In-Home devices, and provides a convenient, easy-to-use process whereby customers can authorize market participants other than the customer’s Retail Electric Provider (Third Parties) access to their electrical usage information and In-Home devices. This document is intended to provide a brief overview of SMT. For a more detailed description of SMT, please see the document entitled “Understanding Smart Meter Texas”[[1]](#footnote-1) (a table of contents from that document is attached hereto as Appendix A).

By making information about the SMT solution publicly available, this document aspires to extend the value of the solution in the following ways:

* ***To demonstrate a model for the development of similar customer- and market-enabling solutions in other jurisdictions***
* ***To demonstrate a model for using one common interface across multiple utilities to access consumer energy usage data***
* ***To demonstrate an interoperable implementation of the Green Button initiative***
* ***To demonstrate a model for using one common interoperable interface to communicate with customer In-Home devices over multiple utility AMS communication networks***
* ***To testify to the potential power of a consensus-based, stakeholder-driven approach to smart grid solution development, producing an interoperable solution that meets the needs of all stakeholders***

# Background and Context

SMT is the product of a collaborative stakeholder-driven process initiated by the Public Utility Commission of Texas (PUCT). Texas has been a frontrunner in the deployment of smart meter and smart grid technology. The Texas deployment began in 2008 and, by the end of August 2014 over 6.8 million smart meters were installed by Texas utilities. Full deployment will include approximately 7 million meters.

## Texas Electric Market

To understand the different parties involved with SMT it is helpful to understand the Texas competitive electric market structure. The majority of the Texas electric power market is deregulated, with the functions of the traditional vertically-integrated electric company unbundled into three separate and distinct companies – power generation companies, Transmission and Distribution Service Providers (TDSPs), and Retail Electric Providers (REPs). Power generation companies own and operate electric generation plants and sell power in the Electric Reliability Council of Texas (ERCOT) competitive wholesale market. TDSPs own and operate the transmission and distribution system and transport electric power to all electric customers within their defined service areas. TDSPs also provide metering services. REPs purchase wholesale electric power for re-sale to retail customers (i.e., residential, commercial, and industrial). Customers buy electricity from a REP of their choice using factors such as price, term, product offerings, and customer service in their decision-making. Finally, Third Parties provide ancillary services to customers (energy efficiency products and HAN services).

## SMT Development History

The genesis of SMT can be traced back to 2007 when the PUCT scheduled workshops to create a stakeholder-driven process tasked with addressing implementation issues related to the deployment of smart meters. Participating stakeholders in this process (which came to be known as the “Advanced Metering Implementation Team” or “AMIT”), included representatives from the TDSPs, REPs, PUCT staff, consumer advocates, smart meter manufacturers, In-Home device manufacturers, HAN service providers, solutions vendors, and the ERCOT. During the course of this consensus-driven, collaborative process, stakeholders defined the business processes and requirements that were required of SMT to support the deployment of smart meters, including retail market transactions, the exchange of customer meter usage data, wholesale settlement among market participants, communications with In-Home devices, and customer education. Those business processes and requirements formed the initial design basis for SMT.

In conjunction with the AMIT, the TDSPs decided that ownership and operation of SMT should be conducted through a joint venture. The TDSPs entered into a Joint Development and Operations Agreement that established the mechanism for making decisions related to the development and use of SMT, the ownership of SMT, and cost sharing of the development, operation, and maintenance of SMT. SMT technical development began in 2009 and, on January 31, 2010, the infrastructure of SMT was initially launched. A second release followed soon after on August 8, 2010, which made additional functionality available to users.

AMIT continued working to refine the initial business requirements through the end of 2012 and further functionality development continued in 2013 and 2014.

## SMT and National Smart Grid Standards Development

The collaborative work of AMIT, resulting in the initial business requirements that became the basis for the design of SMT, occurred in late 2007 through 2009. This was a little before and concurrent with the national effort to identify and develop interoperable smart grid standards. Figure 1 is a timeline showing how the development of SMT fits in with national smart grid policy and regulatory directives and the national smart grid standards effort.



Figure 1: Timeline of SMT and National Smart Grid Standards Development

## ****Maturing SMT Operations and Oversight****

**Prior to 2013, SMT was supported by the AMIT, a standards-setting organization, as that term is defined by the National Institute of Standards and Technology (NIST). The AMIT developed a defined change request process** to provide a method for Texas market participants to request future improvements and enhancements to SMT and to ensure that requested changes to SMT functionality were well vetted by the market participants**. The TDSPs, who own and operate SMT, retain the final determination of whether to accept or reject** any proposed modifications to SMT.

In early 2013, with the majority of smart meters deployed and three years of SMT operational experience, the AMIT activities and oversight of SMT were evaluated. There was a need for a more permanent oversight structure to support SMT’s move into an operational steady state. A plan was drafted to close the AMIT project and move the oversight of SMT to the ERCOT Retail Market Subcommittee (RMS). RMS is an ERCOT subcommittee that serves as a forum for resolving retail market issues that directly affect ERCOT and retail market participants. The SMT change request process, reporting, and user guide activities moved to an Advanced Metering Working Group formed under RMS. The TDSPs retain the ultimate authority for approving or rejecting any proposed modifications to SMT and the PUCT oversees the development of any remaining functionality to be provided by SMT.

# ****Methodology****

## AMIT Meeting Attributes and Design Process

The functionality of SMT was developed in facilitated AMIT meetings. In the AMIT meetings, the stakeholders participated by sharing viewpoints and working towards consensus regarding SMT’s functionality. The AMIT meetings had the attributes of openness, balance of interest, due process, a process for appeals, and consensus. The AMIT meetings were open to any interested party and publically announced. All meeting attendees were encouraged to participate and share their views on the topic at hand. No view was discounted and each issue was thoroughly discussed or researched until a consensus was reached by the participants. The process used by the AMIT to determine the design and functionality of SMT substantially conformed to the methodology set forth in the IEC 62559 IntelliGrid Methodology for Developing Requirements for Energy Systems standard[[2]](#footnote-2). This process included defining high level business processes, creating context diagrams, identifying actors and their roles and interactions, defining projects, and creating and prioritizing business requirements with the help of use case scenarios.

## Identifying Business Processes

The AMIT work began with defining high-level business processes that described the general functional requirements for implementing smart meters in Texas. The following business processes became the base for determining the functionality of SMT.

* Access Meter and Usage Data
* Establish Communications between the Advanced Metering System (AMS) and HAN
* Educate Consumers

## Creating Context Diagrams

In addition to the high level business processes, the AMIT created context diagrams for each of the processes. The context diagrams identified the external entities affected by the process, their high level conceptual “inputs” and “outputs” and their applicability to the specific process that was being diagramed. The context diagram’s external entities were the starting point for identifying the actors associated with SMT.

The AMIT used a use case process to develop a more specific list of actors and their roles. A use case describes the functionality and requirements a stakeholder group has for a system, and how the system will behave to meet those needs. The use case process is a recognized tool for system and smart grid standards development and has been used in many large smart grid projects worldwide. The use case process helped to determine the type of SMT functionality each actor could access.

## Developing Business Requirements

Also, the AMIT used the use case-based process to ensure that a robust set of business requirements was developed to define the functionality and technical requirements associated with SMT. Through the facilitated, stakeholder-driven process, the AMIT created a set of use case scenarios which expanded the original business process functions into well-defined business requirements. The AMIT provided input into the prioritization of each business requirement for implementation.

## SMT Deployment and Operations

SMT became operational in early 2010. Follow-on releases occurred which upgraded the SMT system and provided additional functionality that was identified during the original system specification, but considered to be of a lower priority. Figure 2 shows the timeline of the SMT releases.



Figure 2: SMT Releases

# 

# SMT Functionality

## Overview

SMT provides a broad range of benefits to its users. Chief among these benefits are improved access to and utilization of energy data. By providing timely access to energy usage data, customers can better manage their energy consumption and lower their electric bills. An additional benefit of SMT is access to and communications with customer In-Home devices, which enables the development of innovative retail products. The SMT functionality that enables these benefits is described below.

## Data Repository

SMT provides easy and convenient access to energy usage data to a variety of SMT users and stores that data for a maximum of seven years.

On a daily basis, the TDSPs collect the prior day midnight register read and the prior day interval usage data from the smart meters. They perform an industry standard validation, editing, and estimation (VEE) process[[3]](#footnote-3) on the data before sending the data to SMT. If any data is estimated, it is marked with a status code indicating that it is estimated. Future data uploads containing actual data will replace the estimated data. The TDSPs submit interval usage data files to both ERCOT and SMT using the LodeStar Enhanced (LSE) format for all of their smart meters.

## Data Access

The primary function of SMT is to provide customers, the customer’s REP, and authorized Third Parties secure access to the customer’s smart meter data. The Texas Public Utility Regulatory Act (PURA) states that “all meter data, including all data generated, provided, or otherwise made available, by advanced meters and meter information networks, shall belong to a customer”[[4]](#footnote-4) and the PUCT Advanced Metering Rule 25.130 requires that access to smart meter data be granted to customers, the customer’s REP, and other entities whom the customer authorizes.

Texas was an early adopter of legislation and regulations regarding access to smart meter usage data. On a national level, the Green Button initiative challenged utilities to give customers access to their energy usage information by downloading it in an easy-to-read industry standard format. In 2010, over a year prior to the issuance of the Green Button challenge, the SMT solution implemented the PUCT requirements for smart meter usage access, and customers could download their data in an industry standard format to share with other parties. The SMT solution subsequently implemented the Green Button as a secondary form of data access.

SMT provides access to the following customer smart meter data:

* On demand meter reads
* 15-minute interval usage
* Daily usage
* Monthly usage

## User Interfaces

SMT users can access SMT functionality by using one of the interfaces provided by SMT. These interfaces include a simple, user-friendly web portal (i.e., graphical user interface, or “GUI”), an encrypted File Transfer Protocol Secure (FTPS) folder, and a machine-to-machine interface (i.e., API). Depending upon the type of account a user has and the type of functionality they want to access, they may utilize one or all of these interfaces.

## Third Party Access

Third Parties who want access to a customer’s electric usage information or In-Home devices must have the customer’s permission to do so. SMT provides a convenient, well documented process whereby a Third Party may request a customer’s permission and the customer may accept or reject the request. SMT grants the Third Party access once a customer accepts a Third Party’s request.

## HAN Functionality

HAN functionality is enabled through the use of the ZigBee Smart Energy Profile (SEP) v1.0 HAN communication protocol installed in the smart meters. HAN functionality includes the ability to connect and disconnect In-Home devices to the customer’s HAN and send messages to In-Home devices for general information, pricing information, and demand response, including device control. An SMT HAN User Guide is available on the SMT web portal. It is a comprehensive document describing the SMT HAN functionality and how to access it. Included in the guide are an explanation of the roles each user has related to the SMT HAN functionality, how to connect an In-Home device to the customer’s HAN, how to send messages to an In-Home device, the kinds of messages that may be sent to In-Home devices, a HAN API starter kit, and how to test In-Home devices.

## Education

An additional function of SMT is to educate customers about their electric usage and teach them how to use and access SMT functionality. The Help functions and education provided by SMT include a Help feature, FAQs, user’s guides, and other helpful information sources. SMT also provides users with notices related to planned SMT outages and new SMT features.

SMT maintains a help desk that allows customers, REP, Third Party, regulatory and TDSP users to call and ask for assistance with all aspects of SMT functionality. The SMT help desk can help users with information and assistance with such things as:

* Set up an SMT account
* Login to their account
* Change their password
* Addressing other SMT account specific questions

# Security

With the increasing presence of information technology used in the power utility industry, the need to secure that technology has become more important now than ever before. SMT is cognizant of this need and employs a high level of security. The services provided to SMT’s users are rooted in common information security technologies and practices to ensure all transactions and customer data are protected.

SMT uses a wide array of tools and techniques to ensure security is deeply ingrained in the provided services and associated infrastructure. Because SMT is a web portal and accessible through the internet, it is susceptible to many threats. These threats pose a security risk to SMT, risk that is subsequently overcome through the strategic application of mitigation measures. To effectively mitigate threats and vulnerabilities, SMT has implemented a robust and encompassing security model. This model reflects state laws, industry-independent regulation, applicable guidelines from national organizations, and business-consistent IT security measures.

# Use of Industry Standards

The process of developing and implementing SMT followed widely recognized smart grid methodologies, guiding principles, architectural goals, best practices, smart grid standards and web standards, such as the following:

* GridWise Architecture Council’s Interoperability Layered Categories
* IntelliGrid Methodology for Developing Requirements for Energy Systems
* National Institute of Standards and Technology’s (NIST) Guiding Principles for Identifying Interoperable Smart Grid Standards
* NIST’s Architectural Goals for the Smart Grid
* Department of Energy’s Green Button Initiative
* Payment Card Industry Data Security Standard
* NERC Critical Infrastructure Protection Cyber Security Standards
* NIST’s Guidelines for Smart Grid Cyber Security
* ZigBee Smart Energy Profile version 1.0
* NAESB Third Party Access to Smart Meter-based Information
* UCAIug Home Area Network System Requirements Specification
* Web Standards

# Appendix: ‘Understanding Smart Meter Texas’ Table of Contents

1 Introduction

2 Acronyms and Definitions

[2.1 Acronyms](#_Toc366681804)

[2.1 Definitions](#_Toc366681805)

[3 Background and Context](#_Toc366681806)

[3.1 Texas Policy and Regulatory Directives](#_Toc366681807)

[3.2 Texas Electric Market](#_Toc366681808)

[3.3 SMT History](#_Toc366681809)

[3.4 SMT Benefits](#_Toc366681810)

[3.5 SMT and National Smart Grid Standards Development](#_Toc366681811)

[4 Methodology](#_Toc366681812)

[4.1 AMIT Meeting Attributes and Design Process](#_Toc366681813)

[4.2 Consensus Building Process](#_Toc366681814)

[4.3 Identifying Business Processes](#_Toc366681815)

[4.4 Creating Context Diagrams](#_Toc366681816)

[4.5 Defining Projects](#_Toc366681817)

[4.6 Developing Business Requirements](#_Toc366681818)

[4.7 Technical System Design](#_Toc366681819)

[4.8 SMT Process Prioritization](#_Toc366681820)

[4.9 SMT Deployment and Operations](#_Toc366681821)

[5 Functionality](#_Toc366681822)

[5.1 SMT Conceptual Model](#_Toc366681823)

[5.2 SMT Functions](#_Toc366681824)

[5.3 Data Repository](#_Toc366681825)

[5.4 Meter Data Access](#_Toc366681826)

[5.5 Third Party Access](#_Toc366681827)

[5.6 HAN Functionality](#_Toc366681828)

[5.7 Education](#_Toc366681829)

[5.8 General SMT Usability Solutions](#_Toc366681830)

[6 Registration and User Roles](#_Toc366681831)

[6.1 Registration](#_Toc366681832)

[6.2 Roles](#_Toc366681833)

[7 Interfaces](#_Toc366681834)

[7.1 Web Portal](#_Toc366681835)

[7.2 Secure FTP](#_Toc366681836)

[7.3 Application Programming Interface (API)](#_Toc366681837)

[8 Use Cases](#_Toc366681838)

[8.1 Actors](#_Toc366681839)

[8.2 SMT Use Cases](#_Toc366681840)

[8.3 Storyboards](#_Toc366681841)

[9 Security](#_Toc366681842)

[9.1 Introduction](#_Toc366681843)

[9.2 Threats](#_Toc366681844)

[9.3 Mitigation](#_Toc366681845)

[9.4 SMT and NIST IR 7628](#_Toc366681846)

[10 Use of Industry Standards](#_Toc366681847)

[10.1 GWAC Interoperability Layered Categories](#_Toc366681848)

[10.2 IntelliGrid Methodology](#_Toc366681849)

[10.3 NIST Guiding Principles and Architectural Goals](#_Toc366681850)

[10.4 Green Button Initiative](#_Toc366681851)

[10.5 PCI and NERC CIP Security Standards](#_Toc366681852)

[10.6 ZigBee Smart Energy Profile](#_Toc366681853)

[10.7 NAESB Third Party Access to Smart Meter-based information](#_Toc366681854)

[10.8 UCAIug Home Area Network System Requirements Specification](#_Toc366681855)

[10.9 Web Standards](#_Toc366681856)

[11 Testing](#_Toc366681857)

[11.1 SMT System](#_Toc366681858)

[11.2 Home Area Network Devices](#_Toc366681859)

[12 Operational Support](#_Toc366681860)

[12.1 System Support](#_Toc366681861)

[12.2 Disaster Recovery](#_Toc366681862)

[12.3 SMT Help Desk](#_Toc366681863)

[13 Appendix A: – Example Use Case](#_Toc366681864)

[13.1 EXAMPLE USE CASE](#_Toc366681865)

1. Understanding Smart Meter Texas is filed in PUCT Project #41171 Repository of Advanced Metering Implementation Documents <http://interchange.puc.texas.gov/WebApp/Interchange/application/dbapps/filings/pgSearch.asp> [↑](#footnote-ref-1)
2. IEC 62559 Publicly Available Specification <http://webstore.iec.ch/webstore/webstore.nsf/Artnum_PK/38920> [↑](#footnote-ref-2)
3. TDSPs use VEE requirements as specified in the Uniform Business Practices (UBP) standard [↑](#footnote-ref-3)
4. PURA 39.107(b) [↑](#footnote-ref-4)