ENERGY EFFICIENCY POTENTIAL STUDY FOR THE STATE OF NEW MEXICO

Volume 3: Natural Gas Energy Efficiency Analysis

June 30, 2011

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Acknowledgements

This material is based upon work supported by the Department of Energy under Award Number(s) DE-EE0000108. It was managed by the State of New Mexico's Energy, Minerals and Natural Resources Department's (EMNRD) Energy, Conservation and Management Division.

For supporting this work, we thank EMNRD Secretary John Bemis and EMNRD staff Ken Hughes, Fernando Martinez, Craig O'Hare (formerly of EMNRD), Brian Johnson, Randy Sweat, Susie Marbury and Harold Trujillo.

For providing utility-specific data that were central to the analysis, we thank Erick Seelinger (PNM), Steve Bean (PNM), Dean Brunton (PNM), Sharon James (PNM), Alena Gilchrist (KEMA/PNM), Jan Nelson (SPS/Xcel), Suzanne Doyle (SPS/Xcel), Heather Hemphill (SPS/Xcel), Mandy McLean (SPS/Xcel), Jeremy Peterson (SPS/Xcel), Ruth Sakya (SPS/Xcel), Paul Royalty (El Paso Electric), Susanne Stone (El Paso Electric), Derek Pearson (El Paso Electric) Steve Casey (NM Gas Company), Dru Jones (NM Gas Company), John Fernald (NM Gas Company), Keven Groenewold (NMRECA), Richard Marquez (NMRECA), Lance Adkins (Farmers' Electric Coop), Mike Sims (Farmington Municipal Electric), Thom Moore (Farmers' Electric Coop), Christine Chavez (Los Alamos Dept. of Public Utilities), Julie Williams-Hill (Los Alamos Dept. of Public Utilities), and Deenise Becenti (Navajo Tribal Utility Authority), all of whom were highly supportive and responsive throughout the data acquisition process.

We would also like to thank the stakeholders that provided valuable comments throughout the study and participated in the various stakeholder meetings, particularly Tammy Fiebelkorn (SWEEP), Keith Freischlag (SWEEP), Tom Singer (NRDC), Jeff Primm (PRC), Leslie Padilla (PRC), Marc Martinez (PRC), Roy Stephenson (PRC), Theresa Becenti-Aquilar (PRC), Brendan Miller (NMEDD), Tom Schuster (City of Las Cruces), Erik Aaboe (Santa Fe County), Luis Duran (NM Workforce), Chris Wentz (Galvin Electric Initiative), Calvin Steckler (PSFA), Birk Jones (Yearout), Robin Harder (ENERGY STAR Homes Program), Victoria Sandoval (Graybar), James McLane (WH Pacific), Phyllis Kaplan (CASA) and Robb Thomson.

Finally, we acknowledge the members of the analysis teams from Global and Brattle:

- Global Energy Partners: Cecilia Arzbaecher, Jan Borstein, Gaynoll Cook, Anthony Duer, Vish Ganti, Debyani Ghosh, Patricia Hurtado, Kelly Marrin, Joe Prijyanonda, King Lee, Barb Ryan, Abigail Sanchez, Greg Wikler, Craig Williamson, Sharon Yoshida
- The Brattle Group: Ahmad Faruqui and Doug Mitarotonda

Sincerely,
Bridget Kester and Ingrid Rohmund
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INTRODUCTION

1.1 BACKGROUND

The State of New Mexico's Energy, Minerals and Natural Resources Department's (EMNRD) Energy, Conservation and Management Division contracted with Global Energy Partners to conduct a state-wide energy efficiency (EE) and demand response (DR) market potential study to address utility-level programs in the state. The U.S. Department of Energy (DOE) awarded EMNRD funding for this project through the American Recovery and Reinvestment Act (ARRA) to enhance the State Energy Program.

The 2005 adoption of New Mexico's Efficient Use of Energy Act (EUEA) directs New Mexico to support public utility development of all cost-effective energy efficiency and load management measures. These measures include removing regulatory disincentives and allowing rate recovery of energy efficiency and load management program costs. Under rules set forth by the New Mexico Public Regulation Commission (PRC), investor-owned gas and electric public utilities must obtain PRC approval of energy efficiency programs, implement those programs, and report their results and costs.

No comprehensive study of the potential for energy efficiency strategies and measures in New Mexico has ever been conducted. A 2008 report prepared by Southwest Energy Efficiency Project (SWEEP[1]) broadly addresses policy options for New Mexico's energy efficiency strategy, but does not analyze potential energy efficiency measures individually, or assess existing saturation levels for each measure. The New Mexico and federal public policies encouraging energy efficiency and the recent increase in federal funding for such projects make evident the need for a detailed, comprehensive, current potential study that assesses individual energy efficiency measures and considers regional differences within the state.

1.2 OBJECTIVES

Key objectives for the study include:

- Conduct a state-wide energy efficiency potential study to determine the potential for development of specific energy efficiency measures to reduce the consumption of natural gas and electricity by regions in New Mexico
- Conduct a state-wide demand response potential study to determine the potential for reduction in peak demand through demand response programs
- Identify energy-efficiency measures that meet the total resource cost (TRC) test
    - Specify measures relating to housing and building structures and appliances
    - Address climate zones and other geographic considerations, as well as utility service areas
- Analyze various market penetration rates associated with technical, economic, and achievable potential estimates
- Describe and quantify the strategies for implementing those measures in a manner that produces the maximum achievable energy savings
- Run scenarios based on three levels of avoided costs

[1] Southwest Energy Efficiency Project, *Beyond Code: A Guide to Creating Energy Efficient and Sustainable Buildings in the Southwest*, 2008. http://www.swenergy.org/programs/buildings/codes/beyondcode/SWEEP_Beyond_Code_Guide_2008.pdf

- Provide information to the public

1.3 DEFNITIONS OF POTENTIAL

In this study, we estimate the potential for energy efficiency savings. The savings estimates represent net savings[2] and we developed three types of potential: technical potential, economic potential, and achievable potential. Technical and economic potential are both theoretical limits to efficiency savings. Achievable potential embodies a set of assumptions about the decisions consumers make regarding the efficiency of the equipment they purchase, the maintenance activities they undertake, the controls they use for energy-consuming equipment, and the elements of building construction. For this reason, we developed a range of achievable potential. All four levels are described below.

Technical potential is defined as the theoretical upper limit of energy efficiency potential. It assumes that customers adopt all feasible measures regardless of their cost. At the time of equipment failure, customers replace their equipment with the most efficient option available. In new construction, customers and developers also choose the most efficient equipment option. Examples of measures that make up technical potential in the residential sector include:

- Furnaces with EF 0.96
- Condensing water heater with EF 0.86
- High efficiency stove without pilot light with EF 0.42

Technical potential also assumes the adoption of every available other measure, where applicable. For example, it includes installation of high-efficiency windows in all new construction opportunities and homes constructed to ENERGY STAR standards. The retrofit measures are phased in over a number of years, which is longer for higher-cost measures.

Economic potential represents the adoption of all ***cost-effective*** energy efficiency measures. In this analysis, the total resource cost (TRC) test, which compares lifetime energy and capacity benefits to the incremental cost of the measure, is applied. Economic potential assumes that customers purchase the most cost-effective option at the time of equipment failure and also adopt every other cost-effective and applicable measure.

Achievable - High potential takes into account expected program participation resulting from ideal implementation conditions and customer preferences for energy-efficient technologies and demand response programs. Achievable - High establishes a maximum target for the EE savings that a utility can hope to achieve through its EE programs and involves incentives that represent a substantial portion of the incremental cost combined with high administrative and marketing costs.

Achievable - Low potential represents a lower bound on Achievable potential. It reflects limited energy efficiency program budgets and significant barriers to customer acceptance.

1.4 ABBREVIATIONS AND ACRONYMS

Throughout the report we make reference to several abbreviations and acronyms. Below shows the abbreviation or acronym, along with what it stands for and a reference to the section in the report that defines the abbreviation or acronym.

[2] The baseline forecast includes naturally occurring conservation, so the potential estimates represent net program savings (instead of gross savings).

Table 1-1 Explanation of Abbreviations and Acronyms

Acronym	Explanation	First referred to in
ACS	American Community Survey	Chapter 2.2.1.5
AEO	Annual Energy Outlook	Chapter 2.2.1.5
B/C Ratio	Benefit to Cost Ratio	Chapter 2.1.1.2
BEST	Building Energy Simulation Tool	Chapter 2.2.1.3
C&I	Commercial and Industrial	Chapter 2.2.2.2
D&B	Dun and Bradstreet	Chapter 2.2.1.5
DEEM	Database of Energy Efficiency Measures	Chapter 2.2.1.3
DEER	Database for Energy Efficient Resources	Chapter 2.2.1.4
DR	Demand Response	Chapter 1.1
EE	Energy Efficiency	Chapter 1.1
EF	Energy Factor	Chapter 2.1.1
EIA	Energy Information Administration	Chapter 2.2.1.5
EPRI	Electric Power Research Institute	Chapter 2.2.1.5
EUEA	Efficient Use of Energy Act	Chapter 1.1
EUI	Energy-use Index	Chapter 2.1.2.2
HH	Household	Chapter 2.2.2.2
IOU	Investor Owned Utility	Chapter 2.2.2.2
LoadMAP	Load Management Analysis and Planning	Chapter 2.1.1
MARs	Market Acceptance Rate	Chapter 2.1.2
MMTherm	Million therms	Chapter 2.2.2.5
NTUA	Navajo Tribal Utility Authority	Chapter 3
NWPPC	Northwest Power and Conservation Council	Chapter 2.2.1.4
PIFs	Program Implementation Factors	Chapter 2.1.2
Sq. ft.	Square feet	Chapter 2.2.2.2
SWEEP	Southwest Energy Efficiency Project	Chapter 1.1
TRC	Total Resource Cost	Chapter 1.2
UEC	Unit Energy Consumption	Chapter 2.1.2.2

1.5 REPORT ORGANIZATION

This report is presented in seven volumes:

Volume 1, Executive Summary

Volume 2, Electric Energy Efficiency Analysis

Volume 3, Natural Gas Energy Efficiency Analysis

Volume 4, Demand Response Analysis

Volume 5, Summary of Potential Estimates and Study References

Volume 6, Appendices to Electric Energy Efficiency Analysis

Volume 7, Appendices to Natural Gas Energy Efficiency Analysis

This volume, Volume 3, contains the following chapters:

1. Introduction
2. Analysis Approach and Data Development
3. Market Assessment and Market Profiles
4. Baseline Forecast
5. Energy-Efficiency Measures
6. Energy-Efficiency Potential Estimates

ANALYSIS APPROACH AND DATA DEVELOPMENT

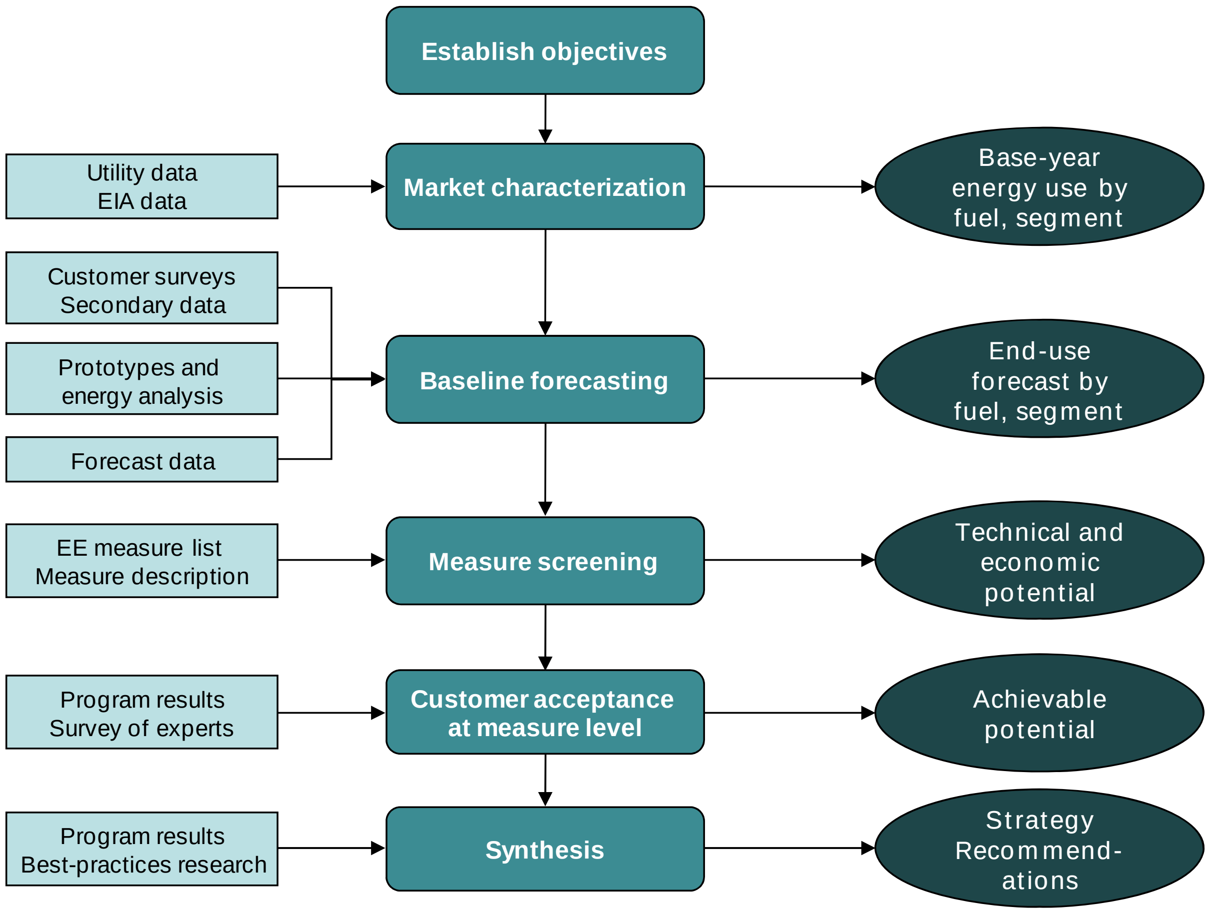
2.1 ANALYSIS APPROACH

To perform the energy-efficiency analysis, a bottom-up analysis approach was taken. It is shown in Figure 2-1 and summarized below.

1. The overall objectives for the study were identified in the RFP. At the outset of the project, the project team met with various stakeholders in the state to refine the objectives. This resulted in a work plan for the study.
2. Performed a market characterization to describe natural gas use for the residential and C&I sectors. This included using utility data and secondary data from sources such as EIA, to develop the base year (2009) natural gas use by sector.
3. Utilized primary market research and secondary sources to understand how customers in New Mexico currently use natural gas. Combining this information with the market characterization, we developed natural gas market profiles for the base year, 2009.
4. Developed a baseline natural gas forecast by sector and end use for 2010 through 2025.
5. Identified and analyzed energy-efficiency measures appropriate for New Mexico.
6. Estimated four levels of energy-efficiency potential, *Technical, Economic, Achievable -High, and Achievable -Low*.
7. Reviewed the current programs offered in the state and researched program best practices to recommend strategies for achieving savings.

The steps are described in further detail throughout the remainder of this chapter.

Figure 2-1 Overview of Analysis Approach



2.1.1 LoadMAP Model

We used the Load Management Analysis and Planning tool (LoadMAP™) to develop the baseline forecast, as well as the estimates of energy-efficiency potential. Global developed LoadMAP in 2007 and has used it for the EPRI National Potential Study and numerous utility-specific forecasting and potential studies. Built in Excel, the LoadMAP framework (see Figure 2-2) is both accessible and transparent and has the following key features.

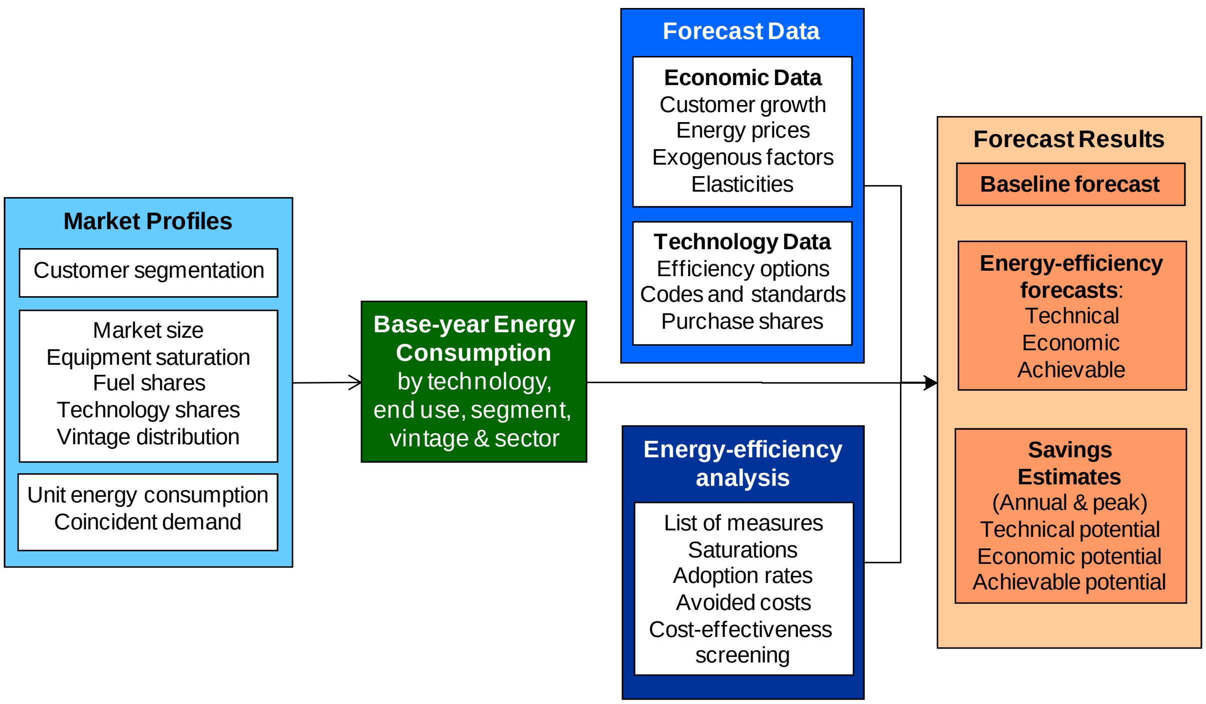
- Embodies the basic principles of rigorous end-use models (such as EPRI's REEPS and COMMEND), but in a more simplified, accessible form.
- Includes stock-accounting algorithms that treat older, less efficient appliance/equipment stock separately from newer, more efficient equipment. Equipment is replaced according to the measure life defined by the user.
- Balances the competing needs of simplicity and robustness by incorporating important modeling details related to equipment saturations, efficiencies, vintage, and the like, where market data are available, and treats end uses separately to account for varying importance and availability of data resources.
- Isolates new construction from existing equipment and buildings and treats purchase decisions for new construction, replacement upon failure, early replacement, and non-owner acquisition separately.
- Uses a simple logic for appliance and equipment decisions. Other models available for this purpose embody complex decision choice algorithms or diffusion assumptions, and the model

parameters tend to be difficult to estimate or observe and sometimes produce anomalous results that require calibration or even overriding. The LoadMAP approach allows the user to drive the appliance and equipment choices year by year directly in the model. This flexible approach allows users to import the results from diffusion models or to input individual assumptions. The framework also facilitates sensitivity analysis.

- Includes appliance and equipment models customized by end use. For example, the logic for space heating equipment is distinct from stoves and clothes dryers.
- Can accommodate various levels of segmentation. Analysis can be performed at the sector level (e.g., total residential) or for customized segments within sectors (e.g., housing type or income level).
- Can accommodate any fuel type and can handle multiple fuel types within one model.

Consistent with the segmentation scheme and the market profiles we describe below, the LoadMAP model provides forecasts of baseline energy use by sector, segment, end use and technology for existing and new buildings. It also provides forecasts of total energy use and energy-efficiency savings associated with the four types of potential.[3]

Figure 2-2 LoadMAP Analysis Framework



2.1.2 Market Characterization

Before assessing the potential savings from EE, it is critical to develop a good understanding of where New Mexico is today in terms of natural gas use and customer behavior. The purpose of the market assessment is to develop market profiles that describe current natural gas use in terms of sector, customer segment, and end use. The base year for this study is 2009 since that was the most recent year for which utility data were available.

The market was also characterized by the entity that serves the end-use electric customers. In addition to providing a snapshot of natural gas use in the base year, it was used to develop

[3] The model computes energy and peak-demand forecasts for each type of potential for each end use as an intermediate calculation. Annual-energy and peak-demand savings are calculated as the difference between the value in the baseline forecast and the value in the potential forecast (e.g., technical potential).

factors for allocating the potential estimates for each sector to each entity, a key objective of the study.

2.1.2.1 Segmentation for Modeling Purposes

The market assessment began by defining the market segments (building types, end uses and other dimensions) that are relevant in New Mexico. The segmentation scheme employed for this project is presented in Table 2-1.

Table 2-1 Overview of Segmentation Scheme for Potentials Modeling

Market Dimension	Segmentation Variable	Dimension Examples
Dimension 1	Sector	Residential, commercial, industrial
Dimension 2	Geographic region	Residential: NM Gas Company Commercial: Statewide Industrial: Statewide
Dimension 3	Building type	Residential (Single family, Multi family, Mobile home, and Low income) Commercial (Offices, Restaurant, Retail, etc.) Industrial (Oil & gas extraction, Other industrial)
Dimension 4	Vintage	Existing and new construction (for residential and commercial sectors)
Dimension 5	End uses	Space heat, water heat, food preparation, etc. (as appropriate by sector)
Dimension 6	Appliances/end uses and technologies	Technologies such as space heating equipment, ovens, process equipment, etc.
Dimension 7	Equipment efficiency levels for new purchases	Baseline and higher-efficiency options as appropriate for each technology

For the residential sector, there was limited market and survey data. For this reason, we did the analysis for New Mexico Gas Company and then allocated the remainder to the other entities within the state. Each group was further divided into customer segments and then end use and technology within each customer segment. The customer segments were defined as:

- ***Single-family homes***. This segment includes single-family detached homes, townhouses, duplexes or row houses, and manufactured homes.
- ***Multi-family homes***. The multi-family segment includes apartments or condos in buildings with more than two units.
- ***Mobile homes***: This segment includes mobile homes. Note that manufactured homes are considered in the single-family segment.
- ***Low-income homes***. The low-income category represents those customers that have an annual household income of $30,000 or less. This segment includes a mixture of home types.

In addition to segmentation by housing type, we identified the set of end uses and technologies that are appropriate for New Mexico shown in Table 2-2.

Table 2-2 Residential End Uses and Technologies

End Use	Technology
Space Heating	Boiler (Radiant)
Space Heating	Boiler (Radiator)
Space Heating	Furnace
Water Heating	Water Heater
Appliances	Clothes Dryer
Appliances	Stove
Miscellaneous	Miscellaneous
Miscellaneous	Pool Heater

For the commercial sector it is useful to think of the segments based on the unique characteristics of the type of building. For this study we are using the following eleven building types:

- Small office (less than 50,000 square feet) – this includes all types of offices, including medical/dental offices
- Large office (greater than or equal to 50,000 square feet) – includes all types of offices including large government facilities
- Restaurant – includes fast-food, sit-down and cafeteria-style restaurants
- Retail – covers the spectrum of retail establishments from small boutiques to large box retailers
- Grocery – includes supermarkets, convenience stores and markets
- Warehouse – includes refrigerated and non refrigerated storage
- School – includes primary and secondary schools
- College – includes colleges, universities and technical colleges
- Health – includes hospitals and nursing homes
- Lodging – includes motels, hotels, resorts and small inns
- Miscellaneous – includes all remaining building types such as public assembly, police stations, amusement parks, and parking garages

In addition to segmentation by building type, we identified the set of end uses and technologies that are appropriate for New Mexico shown in Table 2-3.

The industrial sector is typically segmented by industry type. Because the industrial sector is complex, the study isolated the largest industries for analysis and combined the remaining industries into a single category. The major industry in New Mexico for natural gas use is oil and gas extraction, accounting for 63% of total natural gas sales in the industrial sector in 2009. The remaining industries were combined into the “Other Industrial” category. In addition to segmentation by industry, we identified the set of end uses and technologies that are appropriate for New Mexico. Because these vary by industry, they are shown in Chapter 5.

Table 2-3 Commercial End Uses and Technologies

End Use	Technology
Space Heating	Boiler
Space Heating	Furnace
Water Heating	Water Heater
Food Preparation	Broiler
Food Preparation	Fryer
Food Preparation	Griddle
Food Preparation	Oven
Food Preparation	Range
Food Preparation	Steamer
Miscellaneous	Miscellaneous
Miscellaneous	Pool Heater

With the segmentation scheme defined, the next step was to perform a high-level market characterization of natural gas sales in the base year for each customer segment. We used various data sources to identify the annual sales and number of customers in each customer segment. This information provided control totals (customer counts and energy use totals) for calibrating the LoadMAP model to known data for the base-year.

2.1.2.2 Market Profiles

The next step was to develop market profiles for each sector, customer segment, end use and technology. A market profile includes the following elements:

- ***Market size*** represents the number of customers in the segment. For the residential sector, it is number of households. In the commercial sector, it is floor space measured in square feet.
- ***Saturations*** define the fraction of homes with the natural gas technologies. (e.g., homes with natural gas space heating, commercial floor space with natural gas water heating, etc.).
- ***UEC (unit energy consumption) or EUI (energy-use index)*** describes the amount of natural gas consumed in 2009 by a specific technology in homes that have the technology (in therms/household or therms/square foot).
- ***Intensity*** for the residential sector represents the average use for the technology across all homes in 2009. It is computed as the product of the saturation and the UEC and is defined as therms/household. For the commercial sector, intensity represents the average use for the technology across all floor space in 2009.
- ***Usage*** is the annual natural gas use by a technology/end use in the segment. It is the product of the market size and intensity and is quantified in MMTh.

The market assessment results and the market profiles are presented in Chapter 3.

2.1.3 Baseline Forecast

The next step was to develop the baseline forecast of annual natural gas use by customer segment and end use under a "business as usual" (without new utility programs) scenario for the fourteen-year planning horizon starting in 2012. This process is crucial as it allows for projections to be determined in the absence of future EE programs. The baseline forecast incorporates changes in market conditions and naturally-occurring conservation. The end-use forecast also includes the unfolding impacts of codes and standards. Given the recent extensive attention to energy efficiency at the national level through the American Reinvestment and Recovery Act (ARRA) stimulus efforts and promulgated through the implementation of more stringent codes and standards both nationally and in New Mexico, we have taken steps in our modeling framework to capture the effects of market influences in our baseline forecast assessments. This is an important issue for this study, as the adoption of future codes and standards will have a direct bearing on how much utility program EE potential there can be over and above the effects of those efforts. The baseline forecast is the foundation for the analysis of savings from future EE efforts as well as the metric against which potential savings are measured.

Inputs to the baseline forecast include:

- Current economic growth forecasts (i.e., new construction forecasts)
- Natural gas price forecasts
- Trends in fuel shares and equipment saturations
- Existing and approved changes to building codes and standards[4]
- The (future) effects of utility programs offered prior to 2012
- AEO's forecasts for natural gas sales

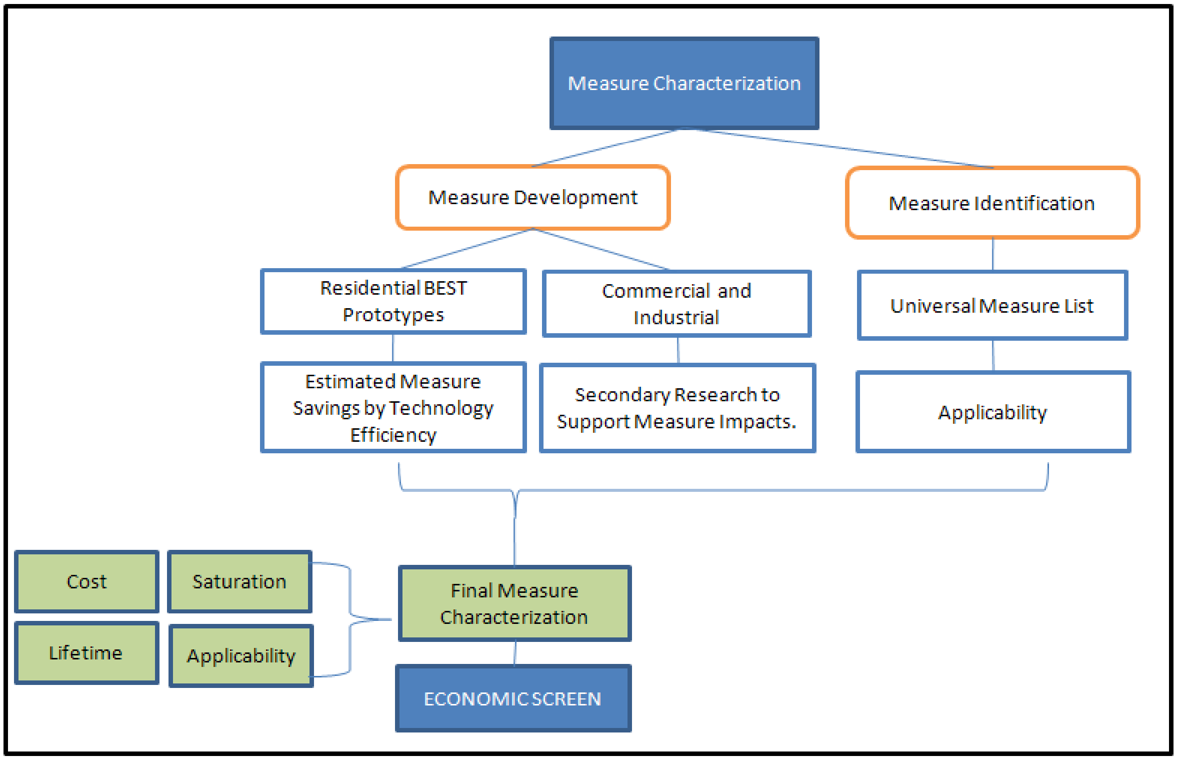
We present the results of the baseline forecast development in Chapter 4.

2.1.1 Energy Efficiency Measure Analysis

This section describes the framework used to assess the savings, costs, and other attributes of energy-efficiency measures. These characteristics form the basis for measure-level cost-effectiveness analyses as well as for determining measure-level savings. For all measures, Global assembled information to reflect equipment performance, incremental costs, and equipment lifetimes. We used this information, along with the avoided costs, in the economic screen to determine economically feasible measures. Figure 2-3 outlines the framework for measure analysis.

[4] At the time of the analysis, the 2009 New Mexico Building Code was in effect. Subsequently, the Small Business –Friendly Task Force reviewed the building code and recommended that the Construction Industries Division hold public hearings to receive feedback to determine whether the more stringent building codes should be rolled back or not. Note that if the 2009 NM Building Code is not put in place, the estimates of potential electricity and natural gas savings in this report would be higher.

Figure 2-3 Approach for Measure Assessment



The framework for assessing savings, costs, and other attributes of energy-efficiency measures involves identifying the list of energy efficiency measures to include in the analysis, determining their applicability to each market sector and segment, fully characterizing each measure, and performing cost-effectiveness screening. Potential measures include the replacement of a unit that has failed or is at the end of its useful life with an efficient unit, retrofit/early replacement of equipment, improvements to the building envelope and other actions resulting in improved energy efficiency, and the application of controls to optimize energy use.

We compiled a robust listing of energy efficiency measures for each customer sector, drawing upon a variety of secondary sources. This universal list of EE measures covers all major types of end-use equipment, as well as devices and actions to reduce energy consumption. If considered today, some of these measures would not pass the economic screens initially, but may pass in future years as a result of lower projected equipment costs or higher avoided costs.

The selected measures can be categorized into types, equipment measures and non-equipment measures according to the LoadMAP taxonomy:

- ***Equipment measures,*** or efficient energy-consuming equipment, save energy by providing the same service with a lower energy requirement. An example is the replacement of a standard efficiency furnace with an ENERGY STAR model. For equipment measures, many efficiency levels are available for a specific technology that range from the baseline unit (often determined by code or standard) up to the most efficient product commercially available. For instance, in the case of boilers, this list begins with the federal standard energy factor (EF) 0.81 unit and spans several levels of efficiency, with the highest efficiency level represented by an EF 0.96 unit.
- ***Non-equipment measures*** save energy by reducing the need for delivered energy, but do not involve replacement or purchase of major end-use equipment (such as a furnace or water heater). An example would be a programmable thermostat that is pre-set to run the heater only when people are home. Non-equipment measures fall into one of the following categories:

- o Building shell (windows, insulation, roofing material)
- o Equipment controls (thermostat, occupancy sensors)
- o Equipment maintenance (cleaning filters, changing setpoints)
- o Whole-building design (natural ventilation, ENERGY STAR home)

We developed a preliminary list of EE measures and circulated it among the stakeholders. The final list included in the study, which reflects feedback from the stakeholders, is presented in Chapter 5.

Once we assembled the list of EE measures, the project team assessed their energy-saving characteristics. For each measure we characterized incremental cost, service life, and other performance factors. Following the measure characterization, we performed an economic screening of each measure, which serves as the basis for developing the economic potential.

2.1.1.1 Representative Measure Data Inputs

To provide an example of the measure data, Table 2-4 and Table 2-5 present samples of the detailed data inputs behind equipment and non-equipment measures, respectively, for the case of residential water heaters in single-family homes. Table 2-4 displays the various efficiency levels available as equipment measures, as well as the corresponding useful life, usage and cost estimates.

Table 2-4 Sample Equipment Measures for Water Heaters – Single Family Home

Efficiency Level	Useful Life	Equipment Cost	Energy Usage (therms/yr)	On Market	Off Market
EF 0.59	15	$390	190.41	2009	2014
EF 0.62	15	$410	181.20	2009	2025
EF 0.63	15	$420	178.32	2009	2025
EF 0.64	15	$550	175.80	2009	2025
EF 0.74	15	$850	151.59	2009	2025
EF 0.76	15	$900	147.60	2009	2025
EF 0.77	15	$925	145.68	2009	2025
EF .86 (Condensing)	15	$2,500	130.63	2009	2025

Table 2-5 lists the non-equipment measures affecting an existing single-family home with natural gas water heating. These measures are also evaluated for cost-effectiveness based on the lifetime benefits relative to the cost of the measure. The total savings are calculated for each year of the model and depend on the base year saturation of the measure, the overall applicability of the measure, and the savings as a percentage of the relevant energy end uses. In addition to the Applicability factor, a Feasibility factor is applied to account for the feasibility of installing the measure.

Table 2-5 Sample Non-Equipment Measures – Single Family Home, Existing

	Saturation in 2009[5]	Applicability/ Feasibility	Lifetime (years)	Measure Installed Cost	Energy Savings (%)
Water Heating - Faucet Aerators	25%	90%	9	$12.70	3.61%
Water Heating - Pipe Insulation	18%	38%	13	$180.00	5.56%
Water Heating - Low-Flow Showerheads	45%	85%	10	$37.95	16.94%
Water Heating - Tank Blanket	19%	75%	13	$24.00	9.17%
Water Heating - Thermostat Setback	5%	75%	5	$40.00	9.17%
Water Heating - Timer	17%	40%	10	$194.00	9.17%
Water Heating - Hot Water Saver	5%	50%	5	$35.00	8.75%

2.1.1.2 Screening Measures for Cost-Effectiveness

Only measures that are "cost-effective" are included in economic and achievable potential, Therefore, for each individual measure an economic screen is performed. This study uses the total resource cost (TRC) test that compares the lifetime benefits of each applicable measure with installed cost that includes material, labor and administration of a delivery mechanism, such as an energy efficiency program.[6] The lifetime benefits are calculated by multiplying the annual energy savings for each measure by all appropriate avoided costs for each year, and discounting the dollar savings to the present value equivalent. The analysis assigns each measure values for savings, costs and lifetimes as part of our measure characterization process. For economic screening of measures, incentives are not included because they represent a simple transfer from one party to another, but have no effect on the overall measure cost.

The LoadMAP model performs this screening dynamically, taking into account changing savings and cost data over time. Thus, some measures pass the economic screen for some — but not all — of the years in the forecast.

It is important to note the following about the economic screen:

- The economic evaluation of every measure in the screen is conducted relative to a baseline condition. For instance, in order to determine the therm savings potential of a measure, therm consumption with the measure applied must be compared to the therm consumption of a baseline condition.
- The economic screening was conducted only for measures that are applicable to each building type and vintage; thus if a measure is deemed to be irrelevant to a particular building type and vintage, it is excluded from the respective economic screen table.

Table 2-6 shows the results of the economic screen for a natural gas furnace for selected years, as well as a natural gas stove. In 2009, the most cost-effective furnace option is EF 0.9, while in 2020, due to rising energy costs, it changes to EF 0.96. The table also shows how the economic choice for stove technology options varies over the study period. Currently the High Efficiency stove is cost-effective relative to the standard option (Baseline w/pilot EF .399) because of the amount of savings achieved relative to the more inefficient baseline technology. However, once the standard changes in 2012, the Baseline w/ pilot technology is no longer available and the standard becomes the much more efficient Baseline w/o Pilot (EF .399). Since the relative savings are not as much, the standard technology is now cost-effective. If the measure passes

[5] Note that saturation levels reflected for 2009 change over time as more measures are adopted.

[6] Note that the TRC test is typically the industry standard for evaluating measure-level cost-effectiveness. There are other test perspectives that are often considered in energy efficiency potential studies. The Participant test measures the benefits and costs from the perspective of program participants as a whole. The Ratepayer Impact Measure (RIM) test measures the difference between the change in total revenues paid to a utility and the change in total costs to a utility resulting from the energy efficiency and demand response programs. The Utility Cost (UC) test measures the costs and benefits from the perspective of the utility administering the program. Neither the RIM nor UC tests are typically applied in the context of measure-level economic screens, but rather in the broader context of energy efficiency programs and initiatives put into place to deliver the energy efficiency measures.

the screen (has a benefit-to-cost (B/C) ratio greater than or equal to 1.0), the measure is included in economic potential. Otherwise, it is screened out for that year.

Table 2-6 Economic Screen Results for Selected Residential Equipment Measures

Technology	2009	2012	2015	2020	2025
Furnace	EF 0.9	EF 0.9	EF 0.9	EF 0.96	EF 0.96
Stove	High Efficiency (EF .42)	High Efficiency (EF .42)	Baseline w/o Pilot (EF .399)	Baseline w/o Pilot (EF .399)	Baseline w/o Pilot (EF .399)

2.1.2 Energy-Efficiency Potential

The approach we used for this study adheres to the approaches and conventions outlined in the National Action Plan for Energy-Efficiency (NAPEE) Guide for Conducting Potential Studies (November 2007).[7] The NAPEE Guide represents the most credible and comprehensive industry practice for specifying energy-efficiency potential. Specifically, four types of potentials were developed as part of this study:

- ***Technical potential*** is a theoretical construct that assumes the highest efficiency measures that are technically feasible to install are adopted by customers, regardless of cost or customer preferences. Thus, determining the technical potential is relatively straightforward. LoadMAP "chooses" the most efficient equipment options for each technology at the time of equipment replacement. In addition, it installs all relevant non-equipment measures for each technology to calculate savings.

  For example, for residential water heaters, as shown in Table 2-4, the most efficient option is an EF 0.86 (Condensing) water heater. The multiple non-equipment measures shown in Table 2-5 are then applied to the energy used by the EF 0.86 (Condensing) water heater to further reduce water heating natural gas use. LoadMAP applies the savings due to the non-equipment measures one-by-one to avoid double counting of savings. The measures are evaluated in order of their B/C ratio, with the measure with the highest B/C ratio applied first. Each time a measure is applied, the baseline energy use for the end use is reduced and the percentage savings for the next measure is applied to the revised (lower) usage.

- ***Economic potential*** results from the purchase of the most efficient *cost-effective* option available for a given equipment or non-equipment measure as determined in the cost-effectiveness screening process described above. As with technical potential, economic potential is a phased-in approach. Economic potential is still a hypothetical upper-boundary of savings potential as it represents only measures that are economic, but does not yet consider customer acceptance and other factors.

- ***Achievable potential*** defines the range of savings that is very likely to occur.
  - ***Achievable – High*** reflects high awareness of efficiency options, minimal barriers to customer adoption, best-practices program design, and incentives that represent a substantial portion of the incremental cost combined with high administrative and marketing costs.
  - ***Achievable - Low*** reflects lower awareness of energy efficiency options, lower incentive levels, and lower administrative and market costs.

The calculation of technical and economic potential is straightforward as described above. To develop estimates for ***achievable potential***, we specify adoption rates for each measure that reflect the combination of market acceptance rates (MARs) and program implementation factors

[7] National Action Plan for Energy Efficiency (2007). *National Action Plan for Energy Efficiency Vision for 2025: Developing a Framework for Change*. www.epa.gov/eeactionplan.

(PIFs). We base the expected adoption rates on the recent experience at New Mexican utilities and the range of achievable potential from the survey experts as follows:

- The range of first-year savings from the survey of experts was used to define the range of achievable potential in 2012. The MARs were defined such that the high end of the range of achievable was reached. The PIFs were defined such that the low end of the range of achievable was reached.
- The range of savings in 10 years from the survey of experts was used to define the range of achievable potential in 2021. MARs and PIFs in ten years were defined so as to achieve the range from the survey. In some cases, the "high" estimate approached or exceeded the percentage of savings represented by economic potential. In these cases, the Achievable – High savings were capped at a maximum of 75% of economic potential.

2.1.2.1 Scenario Analysis

In addition to developing a reference set of potential estimates, two alternative scenarios were also developed:

- ***75% avoided costs*** — the avoided costs from the reference case were scaled down by 25% to create this scenario
- ***150% avoided costs*** — the avoided costs from the reference case were scaled up by 50% to create this scenario

Using these alternate avoided cost forecasts, the economic and achievable potentials were re-estimated. Results of all the potentials analysis are presented in Chapter 6.

2.1.3 Strategy Recommendations

In this final step, we reviewed the potential estimates by measure, customer segment and sector and developed a set of recommendations for strategies for achieving the highest level of energy efficiency. The results of this review are presented in the executive summary in Volume 1 of this report.

2.2 DATA DEVELOPMENT

This section begins with a description of the data sources used in this study, followed by a discussion of how these sources were applied.

2.2.1 Data Sources

The data sources are organized into the following categories:

- Utility provided data
- Statewide customer surveys
- Global Energy Partners' Databases and Analysis Tools
- Energy-efficiency measure data
- Other secondary data and reports

2.2.1.1 Utility-provided Data

In order to appropriately characterize the market in New Mexico, we asked each utility to the following:

- Utility 2009 billing data – customers, usage, revenue
- Number of customers and natural gas sales by segment (housing type, building type, SIC/NAICS)
- Energy forecasts, at the sector level
- Customer growth forecast
- Price history and forecast
- Recent saturation surveys for residential and/or business customers (see Table 2-7)
- Surveys on customer attitudes towards energy efficiency or demand response programs
- Recent load research study
- Avoided costs (peak capacity and energy)
- Discount rate
- Escalation rate
- Line loss factors
- Program data
    - o Description of existing energy efficiency programs
    - o Recent program evaluation reports
    - o Recent energy efficiency potential studies

Table 2-7 Utility Saturation Surveys

Sector	Utility	Description
Residential	PNM	2,903 responses; conducted Spring 2006
Residential	SPS	419 responses; conducted May 2010
Residential	El Paso Electric	2,930 responses; conducted 2010-2011 (LivingWise Program Summary Report)
Residential	Tri-State	conducted 2007
Commercial	PNM	Small commercial: 2,321 responses; conducted Spring 2006 Large commercial: 601 responses; conducted Spring 2006
Commercial	SPS	460 responses; conducted in 2008 (covers entire SPS service territory, including Texas)

2.2.1.2 Statewide Customer Surveys

The recently-completed utility surveys were supplemented with two statewide surveys of residential and C&I customers. The statewide surveys focused on the key data elements necessary for estimating potential and developing strategy. These include:

- Appliance and end-use saturation and inventories by fuel
- Saturation of energy-efficiency measures
- Customer behavior and likely participation in energy efficiency
- Barriers to engaging in energy efficiency programs and activities

For the residential sector, 1,102 households from throughout the state responded to the survey. Global used a simple random sample for the residential sector, but quotas by housing type and utility service area (the three electric IOUs and the rest of the state as a group) were monitored. The results were weighted to be representative of the state based on the utility service territory and housing type. The survey was conducted online through e-Rewards, as well as through telephone surveys through Resolution Research and Marketing. The online survey yielded 806 responses and 296 surveys were conducted by telephone. Telephone surveys were included to reduce bias associated with lack of access to a computer, an issue for low-income and elderly customers.

For the C&I sector, a simple random sample was used, but quotas based on the type and size of businesses from ZapData, as well as utility service area, were monitored. The survey was conducted online through e-Rewards, as well as through telephone surveys through Resolution Research and Marketing. The online survey yielded 420 responses and 319 surveys were conducted by telephone. Originally our goal was to reach 1,000 businesses, but the response rates in New Mexico through online and telephone surveys were lower than average. To develop population estimates, the sample was post stratified by building type and size to develop appropriate expansion weights.

2.2.1.3 Global Energy Partners Databases, Analysis Tools and Reports

Global maintains several databases and modeling tools that we use for forecasting and potential studies.

- ***Energy Market Profiles Database***. Since the late 1990s, Global staff has maintained a database of end-use profiles by sector, customer segment and region for electricity and natural gas. The database contains market size, fuel shares/saturations, UECs/EUIs, intensities and total sales.
- ***Building Energy Simulation Tool (BEST)***. BEST is a derivative of the DOE 2.2 building simulation model, used to estimate base-year UECs and EUIs, as well as measure savings for the HVAC-related measures.
- ***Database of Energy Efficiency Measures (DEEM)***. Global maintains a database of energy efficiency measures for residential, commercial and industrial segments across the U.S. This is analogous to the DEER database developed for California. Global updates the database on a regular basis as it conducts new energy efficiency potential studies.
- ***EnergyShape™ Database***. This database contains end-use load shapes for residential and commercial segments for nine regions in the U.S. For the non-HVAC end uses, we used the EnergyShape data to develop the peak factors that represent the fraction of annual energy use that occurs during the peak hour. The peak factors were calibrated to available utility data for the system peak. The final peak factors were applied to annual energy savings to calculate the peak-demand savings from EE measures.
- ***Recent Studies***. Global has conducted numerous studies of EE potential in the last five years. We checked our input assumptions and analysis results against the results from these other studies which include Consolidated Edison of New York and Avista Energy. In addition, we used the information about impacts of building codes and appliance standards from a recent IEE report.

2.2.1.4 Energy Efficiency Measure Data

In addition to BEST and DEEM (described above), several other sources of data were used to characterize the energy-efficiency measures.

- ***Database for Energy Efficient Resources (DEER)***. The California Energy Commission and California Public Utilities Commission (CPUC) sponsor this database, which is designed to provide well-documented estimates of energy and peak demand savings values, measure costs, and effective useful life (EUL) all with one data source for the state of California. We used the DEER database to perform sanity checks against the measure savings we developed using BEST and DEEM.

- ***Northwest Power and Conservation Council (NWPCC) Sixth Plan workbooks***. To develop its Power Plan, the Council maintains workbooks with detailed information about measures.
- ***Cost data sources***
    - RS Means Facilities Maintenance and Repair Cost Data
    - RS Means Mechanical Construction Costs
    - RS Means Building Construction Cost Data
    - Sixth Northwest Conservation and Electric Power Plan (2010)
    - USGBC — LEED New Construction & Major Renovation (2008)
    - RS Means Green Buildings Project Planning & Cost Estimating Second Edition (2008)
    - Grainger Catalog Volume 398, (2007-2008)
    - Navigant Study

2.2.1.5 Other Secondary Data and Reports

Finally, a variety of secondary data sources and reports were used for this study. The main sources are identified below.

- ***U.S. Census Data***. U.S. Census data included:
    - The American Community Survey (ACS). The ACS is an ongoing survey that provides data every year on household characteristics. http://www.census.gov/acs/www/
    - Census Bureau's 2007 Economic Census. This survey is conducted every five years and collects details on business characteristics. http://www.census.gov/econ/census07/
    - The Census Bureau also provides a mapping of SIC to NAICS codes. http://www.census.gov/eos/www/naics/
- ***Dun and Bradstreet Data***. Dun and Bradstreet (D&B) maintains a large database of business characteristics that is continually updated. For our analysis we used their ZapData program to gather information on the types, size and numbers of commercial and industrial customers within New Mexico. http://www.dnb.com/
- ***California Statewide Surveys***. The Residential Appliance Saturation Survey (RASS) and the Commercial End Use Survey (CEUS) are comprehensive market research studies conducted by the California Energy Commission. These databases provide a wealth of information on appliance use in homes and businesses. RASS is based on information from almost 25,000 homes and CEUS is based on information from a stratified random sample of almost 3,000 businesses in California.
- ***Annual Energy Outlook***. The Annual Energy Outlook (AEO) is conducted each year by the U.S. Energy Information Administration (EIA) which presents yearly projections and analysis of energy topics. For this study, we used data from the 2011 AEO.
- ***Electric Power Research Institute – Assessment of Achievable Potential from Energy Efficiency and Demand Response Programs in the U.S.*** EPRI National Potential Study (2009). In 2009, Global conducted an assessment of the national potential for energy efficiency, with estimates derived for the four DOE regions (including the West region that includes New Mexico).

- ***EPRI End-Use Models (REEPS and COMMEND)***. These models provide the elasticities we apply to electricity prices, household income, home size and heating and cooling.

2.2.2 Data Development

We now discuss how the data sources described above were used for each step of the study.

2.2.2.1 Market Characterization

To construct the high-level market characterization of electricity use and households/floor space for the residential, commercial, and industrial sectors, we applied data from each of the utilities, the Annual Energy Outlook, American Community Survey, and Dun and Bradstreet:

- Historical customer billing data by sector (e.g., residential, commercial, industrial)
- Summary of residential customers by housing type
- Summary of non-residential customers by rate class and size
- Listing of all non-residential customers including annual energy, SIC/NAICS (where available), and customer type

To segment the residential customers into the four segments, we determined the housing type breakdown based on the American Community Survey and applied it to the number of customers reported by the billing data for 2009. The 2009 ACS shows that 35% of households in New Mexico earned less than $30,000 in 2009. We must reduce the number of households in the other segments that are based on home type. Based on the market research conducted for this study, we determined that the home type of low-income households in New Mexico breaks down into the following:

- 64% are single family homes
- 19% are multi-family homes
- 17% are mobile homes

These low income homes were then subtracted from the overall home type segments to give the number of customers by segment.

2.2.2.2 Market Profiles

To develop the market profiles for each segments, we used the following general approach:

1. Develop control totals for each segment. These include market size, segment-level annual natural gas use and annual intensity.
2. The primary market research on residential customers provided information on appliance and equipment saturations, appliance and equipment characteristics, building characteristics, customer behavior, operating characteristics, and energy-efficiency actions already taken. These were compared with the utility saturation surveys and adjusted, if needed.
3. The primary market research for commercial and industrial (C&I) customers was supplemented with the utility market research studies to provide information about appliance and equipment saturations, appliance and equipment characteristics, building characteristics, customer behavior, operating characteristics, and energy-efficiency actions already taken.
4. Incorporated secondary data sources to supplement and corroborate the primary research in items 1 and 2 above.
5. Compared and cross-checked with regional data obtained as part of the EPRI National Potential Study, Energy Market Profiles, and other regional sources.

6. Ensured calibration to control totals for annual natural gas sales in each segment.
7. Worked with the investor-owned utility (IOU) staff and the extended project team to vet the data against their knowledge and experience.

The specific data elements for the market profiles, together with the key data sources, are shown in Table 2-8.

Table 2-8 Data Needs for the Market Profiles

Model Inputs	Description	Key Sources
Market size	Base-year residential dwellings and C&I floor space	• Utility billing data, • American Community Survey, • D&B data, • Statewide Surveys, • Energy Market Profiles
Annual intensity	Residential: Annual energy use per household (therms/hh) C&I: Annual energy use per square foot (therms/sq. ft)	• Utility data • Energy Market Profiles database • Previous studies
Appliance/equipment saturations	Fraction of dwellings with an appliance/technology; Percentage of C&I floor space with equipment/technology	• Statewide survey data, • Utility saturation surveys, • Energy Market Profiles
UEC/EUI for each end-use technology	UEC: Annual natural gas use for a technology in dwelling that have the technology; EUI: Annual natural gas use per square foot for a technology in floor space that has the technology	• HVAC uses: BEST simulations using prototypes developed for NM • Non HVAC uses: Engineering analysis, • Energy Market Profiles • California RASS and CEUS • Results from previous studies
Appliance/equipment vintage distribution	Age distribution for each technology	• Statewide survey data • Utility saturation surveys • Previous studies
Efficiency options for each technology	List of available efficiency options and annual energy use for each technology	• DEEM • DEER • NWPPC workbooks • Annual Energy Outlook • Previous studies

2.2.2.3 Baseline Forecast

Table 2-9 summarizes the LoadMAP model inputs required for the baseline forecast. These inputs are required for each segment within each sector, as well as for new construction and existing dwellings/buildings.

Table 2-9 Data Needs for the Baseline Forecast and Potentials Estimation in LoadMAP

Model Inputs	Description	Key Sources
Customer growth forecasts	Forecasts of new construction in residential and C&I sectors	• IOUs customer growth forecast, • AEO 2011 growth forecast, • Tri-State Potential Study
Equipment purchase shares for baseline forecast	For each equipment/technology, purchase shares for each efficiency level; specified separately for equipment replacement (replace-on-burnout), non-owner acquisition, and new construction	• Shipments data, • AEO 2011 forecast assumptions[8], appliance/efficiency standards analysis
Natural gas prices	Forecast of average natural gas prices	• IOU price forecasts, • AEO price forecast,
Utilization model parameters	Price elasticities, elasticities for other variables (income, weather)	• EPRI's REEPS and COMMEND models, • IOU forecasting data, • AEO

In addition, we implemented assumptions for appliance standards, shown in Table 2-10 and Table 2-11.

[8] We developed baseline purchase decisions using the Energy Information Agency's *Annual Energy Outlook* report (2010), which utilizes the National Energy Modeling System (NEMS) to produce a self-consistent supply and demand economic model. We calibrated equipment purchase options to match manufacturer shipment data for recent years and trended forward.

Table 2-10 Residential Gas Appliance Standards

Today's Efficiency or Standard Assumption
Next Standard (relative to today's standard)

<table>
<tr><th>End Use</th><th>Technology</th><th>2011</th><th>2012</th><th>2013</th><th>2014</th><th>2015</th><th>2016</th><th>2017</th><th>2018</th><th>2019</th><th>2020</th><th>2021</th><th>2022</th><th>2023</th><th>2024</th><th>2025</th></tr>
<tr><td rowspan="2">Space Heating</td><td>Furnace</td><td colspan="15">AFUE 80%</td></tr>
<tr><td>Boiler</td><td colspan="2">EF 0.81</td><td colspan="13">EF 0.82</td></tr>
<tr><td rowspan="2">Water Heating</td><td>Water Heater (<=55 gallons)</td><td colspan="4">EF 0.59</td><td colspan="11">EF 0.62</td></tr>
<tr><td>Water Heater (>55 gallons)</td><td colspan="4">EF 0.59</td><td colspan="11">Condensing Technology</td></tr>
<tr><td rowspan="2">Appliances</td><td>Clothes Dryer</td><td colspan="4">Conventional</td><td colspan="11">5% more efficient</td></tr>
<tr><td>Range/Oven</td><td>Conventional</td><td colspan="14">No Standing Pilot Light</td></tr>
<tr><td>Miscellaneous</td><td>Pool Heater</td><td colspan="2">Conventional</td><td colspan="13">EF 0.82</td></tr>
</table>

Table 2-11 Commercial Gas Appliance Standards

Today's Efficiency or Standard Assumption
Next Standard (relative to today's standard)

<table>
<tr><th>End Use</th><th>Technology</th><th>2011</th><th>2012</th><th>2013</th><th>2014</th><th>2015</th><th>2016</th><th>2017</th><th>2018</th><th>2019</th><th>2020</th><th>2021</th><th>2022</th><th>2023</th><th>2024</th><th>2025</th></tr>
<tr><td rowspan="2">Space Heating</td><td>Furnace</td><td colspan="15">AFUE 76%</td></tr>
<tr><td>Boiler</td><td>EF 0.76</td><td colspan="14">EF 0.82</td></tr>
<tr><td>Water Heating</td><td>Water Heater</td><td colspan="15">EF 0.80</td></tr>
<tr><td>Miscellaneous</td><td>Pool Heater</td><td colspan="2">Conventional</td><td colspan="13">EF 0.82</td></tr>
</table>

2.2.2.4 Energy Efficiency Measure Data Development

Table 2-12 details the data sources used for measure characterization.

Table 2-12 Data Needs for the Measure Characteristics in LoadMAP

Model Inputs	Description	Key Sources
Energy Impacts	The annual reduction in consumption attributable to each specific measure. Savings were developed as a percentage of the energy end use that the measure affects.	• BEST • EPRI National Study • DEEM • DEER • Other secondary sources
Costs	Equipment Measures: Includes the full cost of purchasing and installing the equipment on a per-unit or per-square-foot basis for the residential and C&I sectors, respectively Non-equipment measures: Existing buildings – full installed cost. New Construction - the costs may be either the full cost of the measure, or as appropriate, it may be the incremental cost of upgrading from a standard level to a higher efficiency level.	• DEEM • DEER • Other secondary sources
Measure Lifetimes	Estimates derived from the technical data and secondary data sources that support the measure demand and energy savings analysis	• DEEM • DEER • Other secondary sources
Applicability	Estimate of the percentage of either dwellings in the residential sector or square feet in the C&I sectors where it is technically feasible for the specific measure to be implemented	• DEEM • DEER • Other secondary sources
On Market and Off Market Availability	Expressed as years for equipment measures to reflect when the equipment technology is available or no longer available in the market	• Appliance, building codes, and standards analysis

2.2.2.5 Cost-effectiveness Screening

To perform the cost-effectiveness screening, the following information was needed:

- Avoided cost of energy and avoided cost of capacity. Each IOU provided its own forecasts of avoided energy and capacity costs. The statewide average is shown in Table 2-13.
- Line losses
- Program administration costs. Program administration costs can typically vary between 10-20% of total program costs. For this study, we used a value of 15%.

Table 2-13 Avoided Cost Forecasts – State-Level Average

Natural Gas	2009	2012	2015	2020	2025	% Change 2009-2025
Avoided Cost of Energy ($/MMTherm)	$707	$890	$880	$950	$920	30%

2.2.2.6 Potentials Estimation

To estimate potentials, three sets of parameters were required.

- ***Adoption rates for non-equipment measures.*** Rather than installing all non-equipment measures in the first year of the forecast (instantaneous potential), they are phased in according to four adoption schedules that vary based on equipment cost and measure complexity. The adoption rates are developed based off of expert opinion and engineering review of how quickly the market could absorb these measures. Typically, measures that cause disruption to the building (i.e. wall insulation in existing buildings) receive longer adoption curves while those with 'drop-in' installations (i.e. Programmable Thermostats in new buildings) receive shorter ones. The adoption rates are applied in LoadMAP to calculate technical and economic potential.
- ***Market acceptance rates***. These factors are applied to Economic potential to estimate Achievable – High potential. These rates were developed using information from the EPRI National Potential Study, the Northwest Power Conservation Council ramp rates and previous potential studies. They were adjusted to align with the upper end of the range of potential from the survey of experts.
- ***Program implementation factors***. These factors are applied to Achievable – High potential to calculate Achievable – Low potential. These rates were developed using information from the EPRI National Potential Study, and previous potential studies. They were adjusted to align with the lower end of the range of potential from the survey of experts.

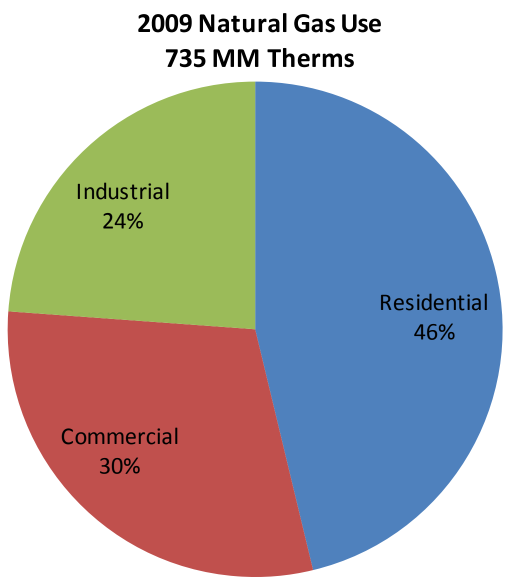
MARs and PIFs are presented in Volume 7.

MARKET ASSESSMENT AND MARKET PROFILES

New Mexico is a widely diverse state. It has a population of just over two million people, but spread over 121,000 square miles, making New Mexico the sixth-most sparsely populated state. The state is heavily influenced by its years under Spanish rule, as well as the large population of Native Americans. New Mexico has the highest percentage of Hispanics and third-highest percentage of Native Americans among U.S. states. New Mexico shares a border with Texas, Arizona, Colorado, Utah, and Oklahoma, as well as the Mexican states of Chihuahua and Sonora. New Mexico is known for its arid climate, but the landscape includes deserts, mesas, high plains and snow-covered mountains. The largest city in the state is Albuquerque, where almost one-third of the population currently lives. Las Cruces, located in the agriculture center of the state, is the second largest city. Santa Fe, at 7,199 ft, is the highest state capital in the United States. The top industries in the state are oil and gas production, tourism, and Federal government. New Mexico is the third-leading crude oil and natural gas producer in the U.S.

Total natural gas use for the residential, commercial and industrial sectors in New Mexico in 2009 was 735 MMTh. As shown in Figure 3-1, the largest sector is residential, accounting for 46%, or 340 MMTh. The remaining use is split between commercial and industrial sectors.

Figure 3-1 Sector-Level Natural Gas Use, 2009



Natural gas providers consist of investor-owned utilities (IOUs), municipalities, rural electric coops and the Navajo Tribal Utility Authority (NTUA), as shown in Table 3-1. The IOUs account for 71% of total customers and 66% of total natural gas use in the state.

Table 3-1 Natural Gas Use by Entity, 2009

Utility	Total Number of Customers	Total 2009 Sales Therms
New Mexico Gas Company	497,977	563,951,770
Village of Corona	81	100,228
DCP Midstream LP	-	9,761,903
Deming Gas System	5,300	5,339,938
Eastern New Mexico Natural Gas	1,008	735,016
El Paso Natural Gas Company	-	4,294,033
EMW Gas Association	4,990	4,104,809
Village of Hatch	794	1,112,244
Las Cruces Municipal Gas	30,536	24,892,347
City of Las Vegas Natural Gas Department	4,708	6,222,937
City of Los Alamos	7,608	8,693,892
Town of Mountainair	556	411,779
Natural Gas Company of America	5	2,502,616
Navajo Tribal Utility Authority	2,390	7,189,018
PNM Gas Services	-	56,637,384
Raton Natural Gas	3,237	3,730,755
Rio Grande Natural Gas	15,952	11,917,632
City of Socorro	3,056	2,944,385
Wagon Mound Gas System	70	120,465
Zia Natural Gas	24,686	19,985,926
Total	**602,954**	**734,649,074**

3.1 RESIDENTIAL SECTOR

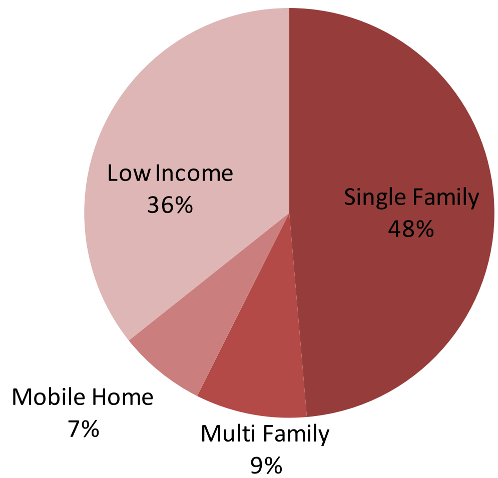
This section characterizes the residential market at a high level, and then provides a profile of how customers in each segment use natural gas by end use.

Total residential natural gas use in 2009 was 340 MMTh. Customer information for each segment is shown in Table 3-2.The single-family segment used almost half the total residential sector natural gas in 2009 as a result of the largest number of customers and the highest intensity. The low-income segment is second highest.

Table 3-2 Residential Sector Natural Gas Usage and Intensity by Segment Type

Segment	Intensity (therms/Household)	Customers	MM Therms (2009)	% of Total Usage
Single- Family	665.18	248,373	165	49%
Multi -Family	439.02	67,941	30	9%
Mobile home	525.49	44,552	23	7%
Low Income	618.61	196,027	121	36%
Total	**610.02**	**556,892**	**340**	**100%**

Figure 3-2 Residential Natural Gas Use by Customer Segment, 2009



As we describe in the previous chapter, the market profiles provide the foundation upon which we develop the baseline forecast. The market profile for the residential sector as a whole is presented in Table 3-3. The residential market profiles for each housing segment are presented in Volume 7.

Table 3-3 Market Profile for the Residential Sector

Average Market Profiles

End Use	Technology	Saturation	UEC (Th)	Intensity (Th/HH)	Usage (MMTh)
Space Heating	Furnace	69.8%	491	342.9	191
Space Heating	Boiler (Radiator)	9.0%	495	44.6	25
Space Heating	Boiler (Radiant)	0.0%	-	-	-
Water Heating	Water Heater	87.7%	204	179.2	100
Appliances	Clothes Dryer	16.9%	32	5.4	3
Appliances	Stove	55.7%	47	26.1	15
Miscellaneous	Pool Heater	0.9%	196	1.7	1
Miscellaneous	Miscellaneous	100.0%	10	10.3	6
Total				**610**	**340**

Figure 3-3 presents the end-use breakout for the residential sector as a whole. Space heating accounts for two-thirds of the usage, followed by water heating. Additional natural gas consumption is allocated among appliances and miscellaneous.

Figure 3-3 Residential Natural Gas Use by End Use, 2009

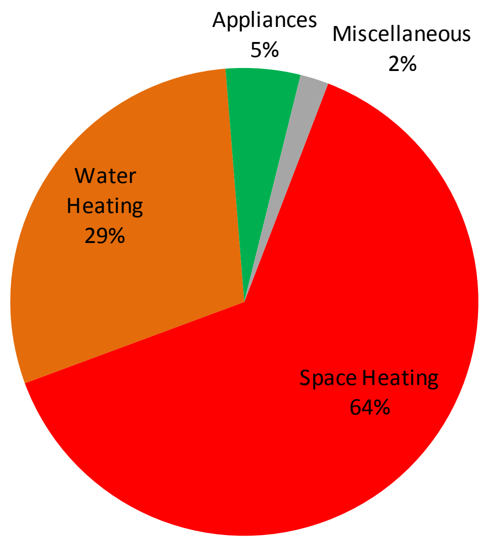
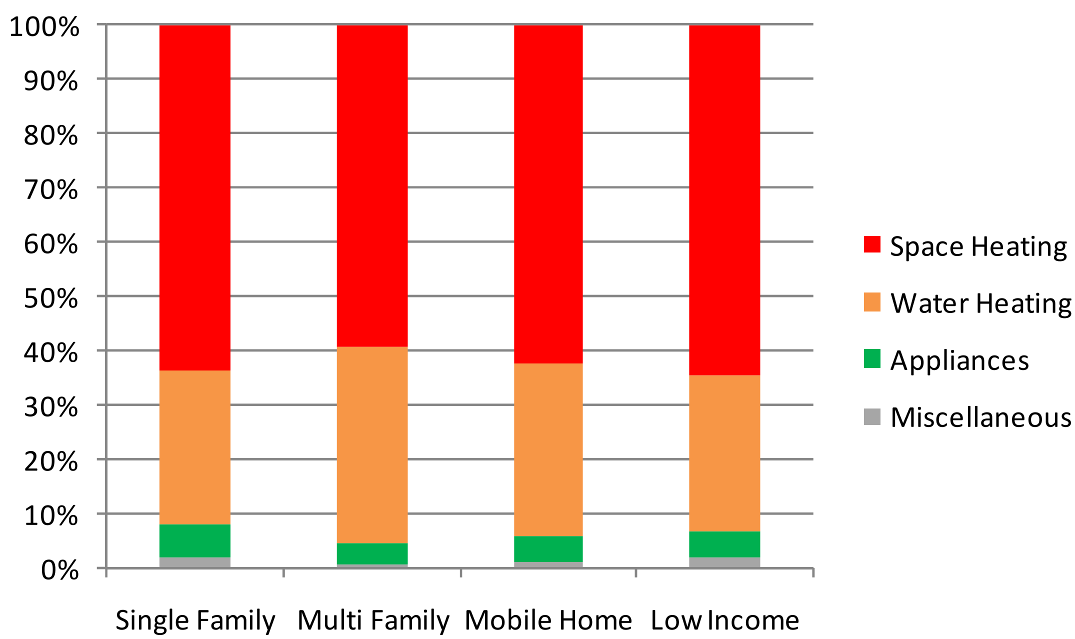


Figure 3-4 presents the end-use shares of total natural gas use for each housing type. Most end uses have a fairly constant share across segments. However, the relative use for miscellaneous is lower for the multi-family and low-income segments than for single family homes, while the share for appliances is lower in single family homes relative to other uses.

Figure 3-4 End-Use Shares of Total Natural Gas Use by Housing Type, 2009



3.2 COMMERCIAL SECTOR

Total natural gas use in the commercial sector in 2009 was 220 MMTh. Using statewide survey data and secondary sources, total commercial floor space is estimated at 551 million square feet, implying an average intensity of 0.4 Therms per square foot per year.

Table 3-4 presents the annual natural gas use, floor space and intensity estimates for each building type. The largest segment is miscellaneous, with 119 million square feet and the largest amount of natural gas usage with over 57 MMTh. As expected, restaurants have the highest intensity due to the large amount of cooking and refrigeration. Large offices, small offices, schools, and colleges segments have the lowest intensities.

Table 3-4 Commercial Sector Market Characterization Results, 2009

Segment	Annual Use MMTh	Floor Space (million sq. ft.)	Intensity (Therms/sq.ft.)
Small Office	12	40	0.3
Large Office	13	59	0.2
Restaurant	19	15	1.3
Retail	27	78	0.4
Grocery	8	18	0.4
Warehouse	14	75	0.2
School	18	62	0.3
College	9	29	0.3
Health	32	33	1.0
Lodging	10	24	0.4
Miscellaneous	57	119	0.5
Total	**220**	**551**	**0.4**

Table 3-5 shows the market profile for the commercial sector as a whole, representing a composite of the eleven building types. Overall, about 55% of commercial floor space is heated with natural gas. Approximately 45% of the commercial floor space has water heated by natural gas. Food preparation is in about 18% of the floor space, but is higher for segments like restaurants which have much more food preparation in the building.

Market profiles for each building type are presented in Volume 7.

Table 3-5 Commercial Sector Composite Market Profile, 2009

Average Market Profiles

End Use	Technology	Saturation	EUI (Thrm)	Intensity (Thrm/Sqft)	Usage (mmThrm)
Space Heating	Furnace	27.3%	0.27	0.07	40
Space Heating	Boiler	27.4%	0.26	0.07	39
Water Heating	Water Heater	44.8%	0.19	0.08	46
Food Preparation	Appliances	18.1%	0.31	0.06	31
Miscellaneous	Pool Heater	1.9%	0.13	0.00	1
Miscellaneous	Miscellaneous	100.0%	0.11	0.11	62
Total				**0.40**	**220**

Figure 3-5 shows the breakdown of annual natural gas usage by end use. Space heating is the largest single end use in the commercial sector, accounting for over one-third of total usage. Water heating is second, followed by miscellaneous, and food preparation.

Figure 3-5 Commercial Natural Gas Consumption by End Use, 2009

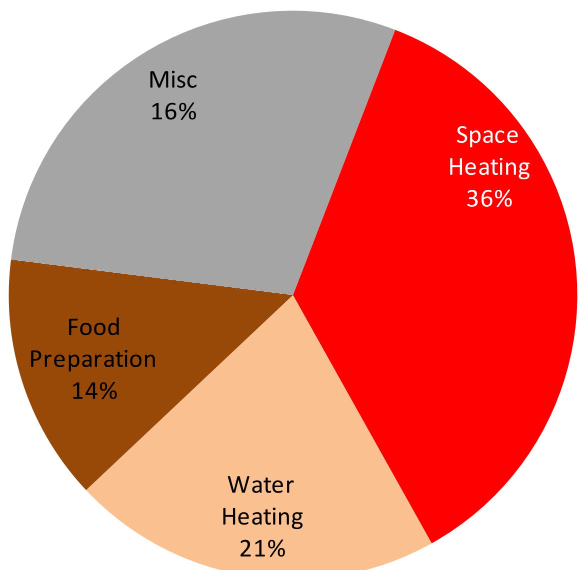
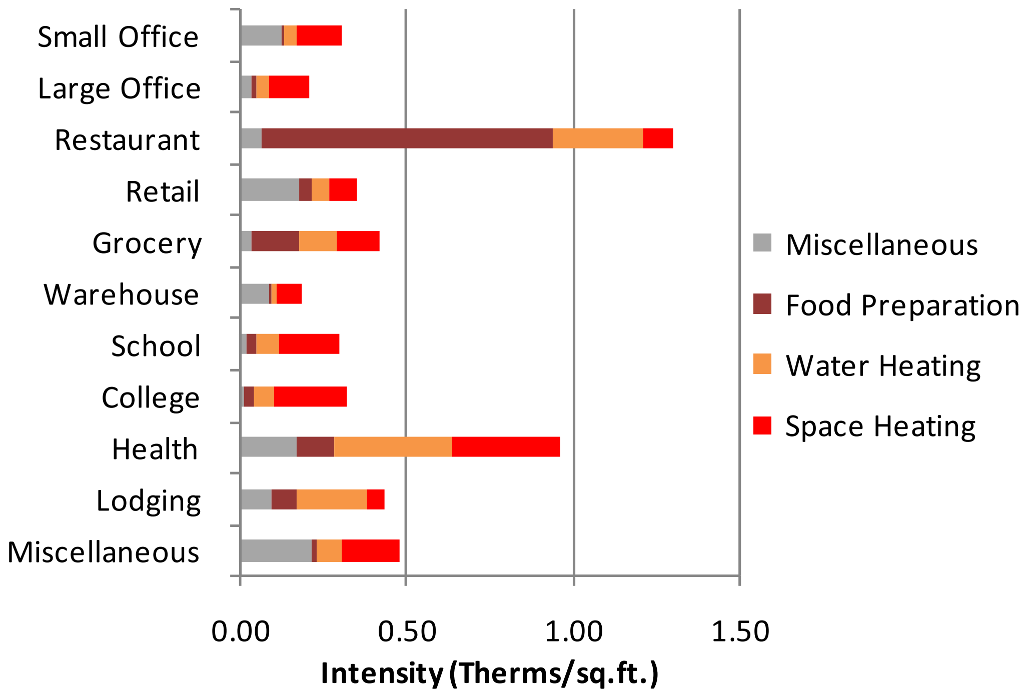


Figure 3-6 illustrates how the end-use composition of natural gas use varies by building type. Observations include the following:

- Space heating and water heating are major end uses across all building types
- Food preparation has the largest share in restaurants

Figure 3-6 Commercial End Use Intensities by Building Type, 2009



3.3 INDUSTRIAL SECTOR

The industrial sector accounts for almost one-quarter of total natural gas sales. Oil and gas extraction is the largest industry throughout the state, accounting for 63% of total industrial natural gas sales in 2009. In order to capture the measures that are specific to this industry we isolated it, while combining the remaining industries into the “Other Industrial” category.

In 2009, total natural gas sales to the industrial sector were175 MMTh. Because data on floor space for the industrial sector is not a meaningful measure we describe and forecast natural gas use relative to the base-year values.

As with the residential and commercial sectors, the industrial market profiles characterize natural gas use in terms of end use and technology for the base year 2009. Table 3-6 shows the composite market profiles for the industrial sector.

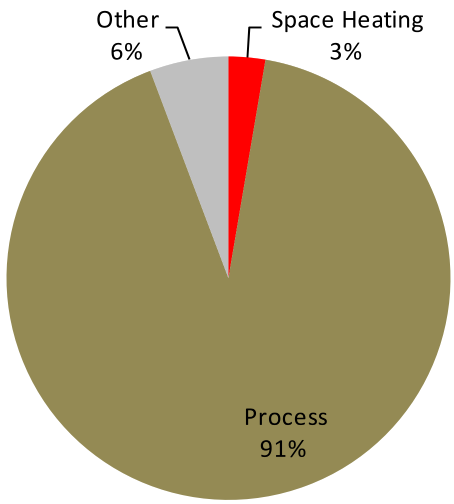
Table 3-6 Industrial Market Profile, 2009

Average Market Profiles

End Use	Technology	Usage (mmThrm)	% of usage
Space Heating	Furnace	4	2%
Space Heating	Boilers	1	1%
Process	Process Heating	160	91%
Process	Process Cooling	0	0%
Process	Other Process	1	0%
Other	Other Uses	10	6%
	Total	**175**	**100%**

Figure 3-7 presents the end-use breakout for the industrial sector in 2009. Process is the largest overall end use for the industrial sector, accounting for 91% of energy use. Space heating and other end uses make up the rest.

Figure 3-7 Industrial Natural Gas Use by End Use, 2009



BASELINE FORECAST

Prior to developing estimates of energy-efficiency potential, a baseline end-use forecast was developed to quantify how natural gas is used by end use in the base year and what the consumption of each fuel is likely to be in the future in absence of new utility programs. The baseline forecast serves as the metric against which energy-efficiency potentials — technical, economic, and achievable — are measured.

4.1 RESIDENTIAL SECTOR

In general, the baseline forecast incorporates assumptions about economic growth, natural gas prices, appliance/equipment standards and building codes already mandated, and naturally-occurring conservation. As mentioned above, the residential analysis was performed separately for New Mexico Gas Company. In this section, we present the results for the state as a whole. The separate forecasts are presented in Volume 7.

Figure 4-1 presents the baseline forecast at the end-use level for the residential sector as a whole. Overall, residential use increases steadily, from 340 MMTh in 2009 to 437 MMTh in 2025, a 28.5% increase. By comparison, the 2011 AEO forecast increases by 2% over the same time horizon.

Table 4-1 shows the end-use forecast at the technology level. Specific observations include:

1. The primary reason for the reduction in the baseline forecast beginning in 2012 is the turnover in natural gas furnaces.
2. Water heating stays relatively flat reflecting the appliance standards that are offset partially by higher saturations.
3. Appliances increase slightly, reflecting the small increases in saturations of dishwashers, clothes washers and clothes dryers which offset the efficiency gains, particularly in the refrigeration appliances due to standards.

Figure 4-1 Residential Baseline Forecast by End Use

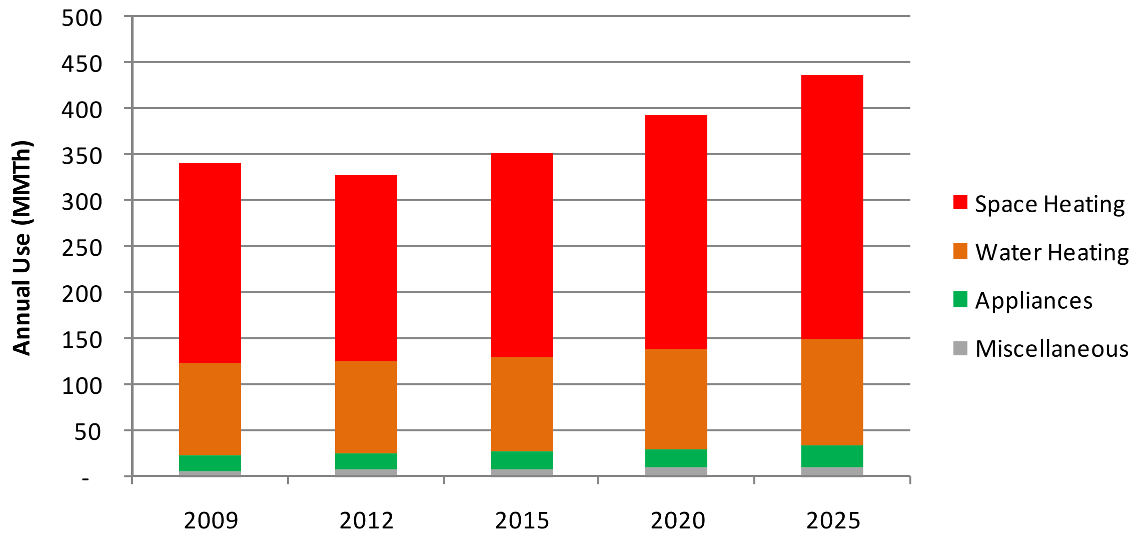
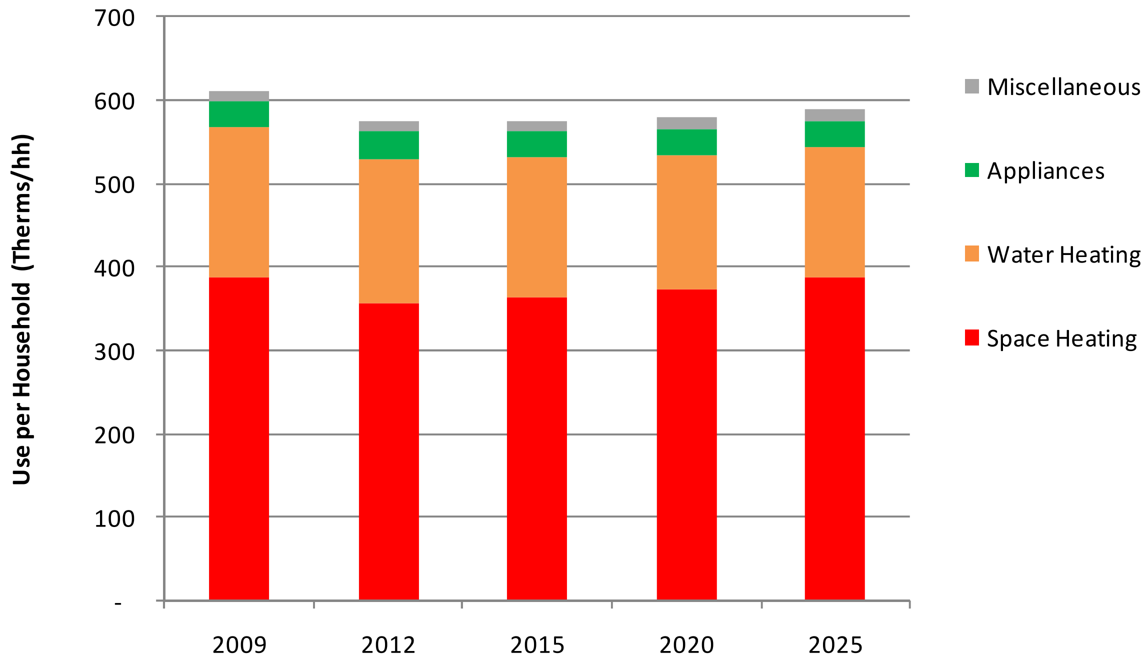


Table 4-1 Residential Baseline Natural Gas Forecast by End Use and Technology (MMTh)

End Use	Technology	2009	2012	2015	2020	2025	% Change ('09-'25)	Avg. growth rate
Space Heating	Furnace	191	180	195	223	252	32.2%	1.7%
	Boiler (Radiator)	25	24	26	30	34	36.6%	2.0%
	Boiler (Radiant)	-	0	0	1	1	-	-
Water Heating	Water Heater	100	99	102	108	116	15.9%	0.9%
Appliances	Clothes Dryer	3	3	4	4	5	58.4%	2.9%
	Stove	15	15	16	17	18	23.8%	1.3%
Miscellaneous	Miscellaneous	6	6	7	8	9	63.9%	3.1%
	Pool Heater	1	1	1	1	1	57.1%	2.8%
Total		**340**	**328**	**352**	**393**	**437**	**28.5%**	**1.6%**

Figure 4-2 presents the forecast of use per household. Most noticeable is that space heating use decreases through 2015, as the boiler standard comes into effect. Use in the other end uses remains flat over the forecast period, reflecting the more efficient standards which offset the increase in saturation in gas appliances.

Figure 4-2 Residential Baseline Natural Gas Use per Household by End Use



4.2 COMMERCIAL SECTOR

Natural gas use in the commercial sector remains relatively flat during the forecast horizon. It starts at 220 MMTh in 2009, decreases from 2010 to 2015 and increases to 238 MMTh in 2025. Figure 4-3 and Table 4-2 present the baseline forecast at the end-use level for the commercial sector as a whole. Most end uses show modest growth over the forecast period.

Figure 4-3 Commercial Baseline Natural Gas Forecast by End Use

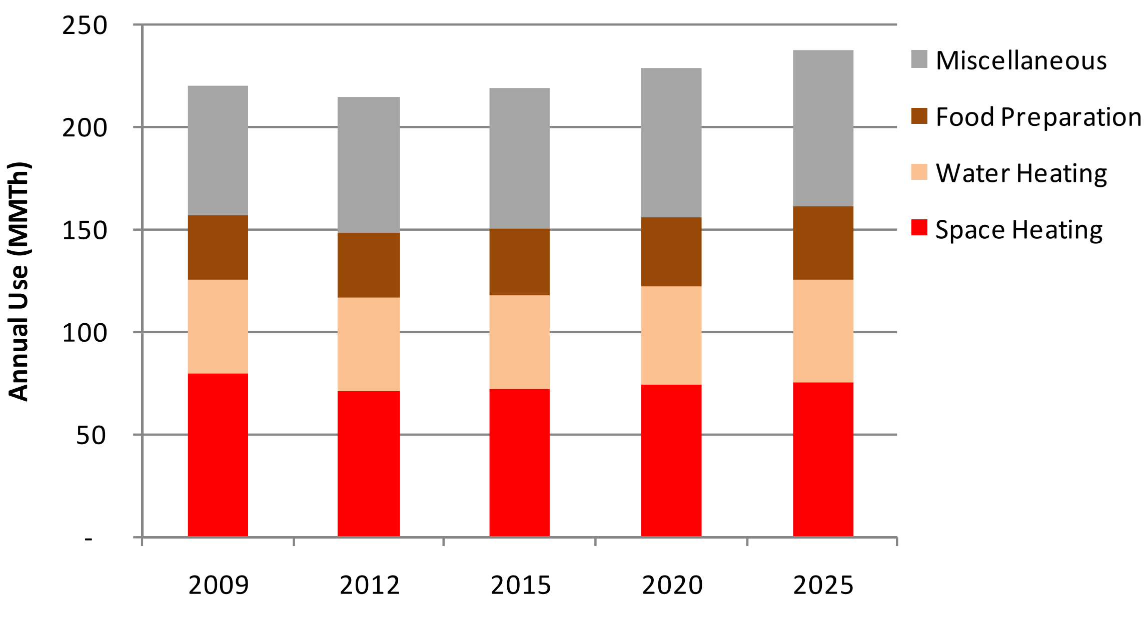


Table 4-2 Commercial Natural Gas Consumption by End Use (MMTh)

End Use	2009	2012	2015	2020	2025	% Change	Avg. growth rate
Space Heating	79	71	72	74	75	-5.2%	-0.34%
Water Heating	46	45	45	48	50	8.3%	0.50%
Food Preparation	31	32	33	34	36	15.3%	0.89%
Miscellaneous	63	66	68	73	77	21.1%	1.20%
Total	**220**	**214**	**219**	**228**	**238**	**8.1%**	**0.49%**

Table 4-3 presents the commercial sector forecast by technology.

Table 4-3 Commercial Baseline Natural Gas Forecast by End Use and Technology (MMTh)

End Use	Technology	2009	2012	2015	2020	2025	% Change ('09-'25)	Avg. growth rate
Space Heating	Furnace	40.1	36.5	37.4	38.3	38.8	-3.2%	-0.2%
	Boiler	39.2	34.7	34.8	35.5	36.3	-7.3%	-0.5%
Water Heating	Water Heater	46.2	44.8	45.4	47.5	50.1	8.3%	0.5%
Food Preparation	Fryer	7.9	8.2	8.4	8.8	9.2	16.0%	1.0%
	Oven	3.7	3.8	4.0	4.2	4.4	17.7%	1.1%
	Broiler	6.0	6.2	6.4	6.9	7.2	21.3%	1.3%
	Griddle	3.9	4.0	4.2	4.4	4.7	20.0%	1.3%
	Range	4.0	4.2	4.3	4.6	4.8	20.0%	1.3%
	Steamer	5.4	5.4	5.4	5.4	5.3	-1.2%	-0.1%
Miscellaneous	Pool Heater	1.4	1.4	1.5	1.5	1.6	14.6%	0.9%
	Miscellaneous	62.0	64.5	66.9	71.2	75.2	21.3%	1.3%
Total		**220**	**214**	**219**	**228**	**238**	**8.1%**	**0.5%**

4.3 INDUSTRIAL SECTOR

Figure 4-4 and Table 4-4 present the baseline forecast at the end-use level for the industrial sector as a whole. Overall, industrial annual energy use increases steadily from 175 MMTh in 2009 to 243 MMTh in 2025, a 38.8% increase. The AEO 2011 forecast increases by 42% over this same time period.

Figure 4-4 Industrial Baseline Natural Gas Forecast by End Use

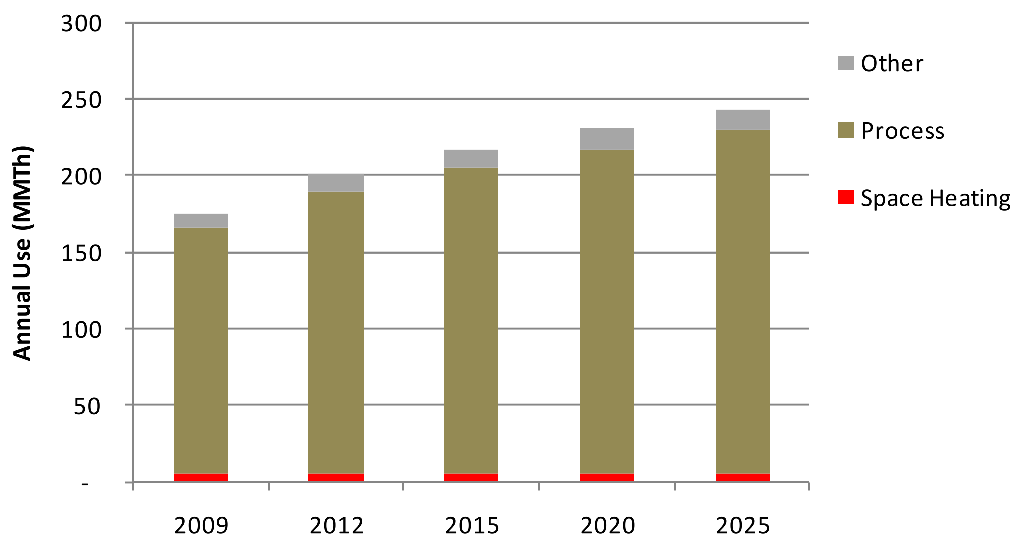


Table 4-4 Industrial Natural Gas Consumption by End Use (MMTh)

End Use	2009	2012	2015	2020	2025	% Change	Avg. growth rate
Space Heating	5	5	5	5	5	10.9%	0.65%
Process	160	184	199	212	224	39.6%	2.08%
Other	10	12	13	13	14	39.3%	2.07%
Total	**175**	**200**	**217**	**231**	**243**	**38.8%**	**2.05%**

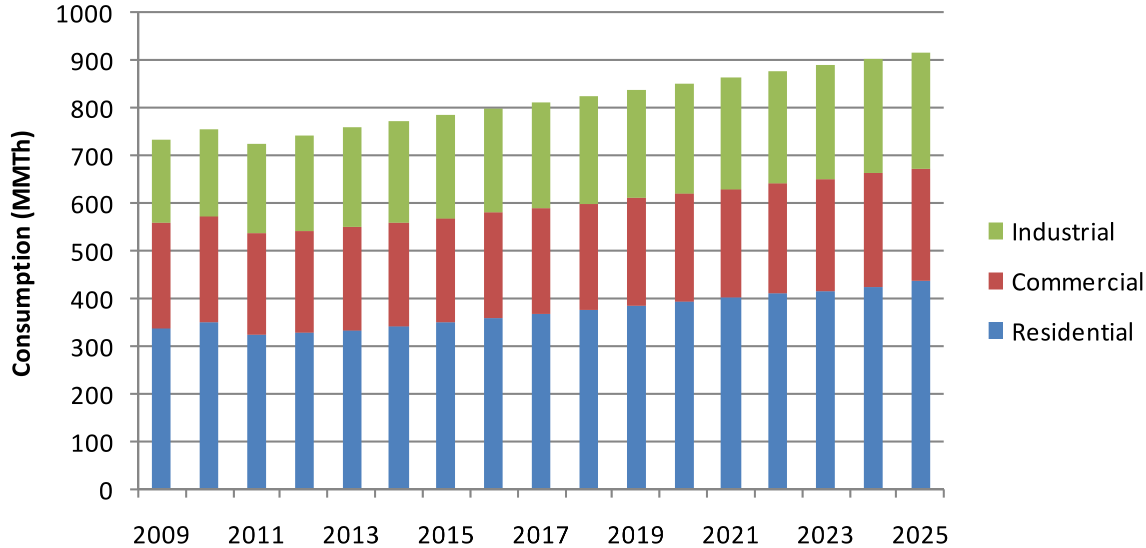
4.4 BASELINE FORECAST SUMMARY

Table 4-5 and Figure 4-5 provide an overall summary of the baseline forecast by sector and for New Mexico as a whole. Overall, the forecast for the next 16 years is steady, reflecting modest growth in customers and the industrial economy, which offset appliance and equipment standards and naturally occurring conservation.

Table 4-5 Baseline Forecast Summary

Sector	2009	2012	2015	2020	2025	% Change	Avg. growth rate
Residential	340	328	352	393	437	29%	1.6%
Commercial	220	214	219	228	238	8%	0.5%
Industrial	175	200	217	231	243	39%	2.0%
Total	**735**	**742**	**787**	**852**	**917**	**25%**	**1.4%**

Figure 4-5 Baseline Forecast Summary



ENERGY-EFFICIENCY MEASURES

5.1 LIST OF ENERGY EFFICIENCY MEASURES

The first step of the energy efficiency measure analysis is to identify the list of all relevant energy efficiency measures that should be considered for the New Mexico potential assessment.

For this study, Global prepared a preliminary list of measures for all the stakeholders to review. We received quite a bit of feedback from the utilities and SWEEP. Their suggestions are included in the final measure list.

- ***Residential Measures***. The residential measures span all end uses and vary significantly in the manner in which they impact energy consumption. Table 5-1 shows the residential equipment measure options and the segments for which they were modeled. Table 5-2 shows the residential non-equipment measure options. All residential measures considered for this study are described in Volume 7.
- ***Commercial Measures***. Table 5-3 and Table 5-4 present a summary of the commercial equipment and non-equipment measures, respectively. The measures shown were modeled for nearly all of the commercial building types, both new and existing, with only a few exceptions where it does not apply to a particular building type. All commercial measures considered for this study are described in Volume 7.
- ***Industrial Measures***. Table 5-5 presents a summary of the industrial equipment and non-equipment measures. All industrial measures considered for this study are described in Volume 7.

Table 5-1 Summary of Residential Equipment Measures

End Use	Technology	Efficiency Option	Single Family (existing & new)	Mulfi Family (existing & new)	Mobile Home (existing & new)	Low Income (existing & new)
Space Heating	Furnace	EF 0.8	X	X	X	X
Space Heating	Furnace	EF 0.83 (Energy Star)	X	X	X	X
Space Heating	Furnace	EF 0.9	X	X	X	X
Space Heating	Furnace	EF 0.96	X	X	X	X
Space Heating	Boiler (Radiator)	EF 0.81	X	X	X	X
Space Heating	Boiler (Radiator)	EF 0.82	X	X	X	X
Space Heating	Boiler (Radiator)	EF 0.85	X	X	X	X
Space Heating	Boiler (Radiator)	EF 0.95	X	X	X	X
Space Heating	Boiler (Radiant)	EF 0.81	X	X	X	X
Space Heating	Boiler (Radiant)	EF 0.82	X	X	X	X
Space Heating	Boiler (Radiant)	EF 0.85	X	X	X	X
Space Heating	Boiler (Radiant)	EF 0.95	X	X	X	X
Water Heating	Water Heater	EF 0.59	X	X	X	X
Water Heating	Water Heater	EF 0.62	X	X	X	X
Water Heating	Water Heater	EF 0.63	X	X	X	X
Water Heating	Water Heater	EF 0.64	X	X	X	X
Water Heating	Water Heater	EF 0.74	X	X	X	X
Water Heating	Water Heater	EF 0.76	X	X	X	X
Water Heating	Water Heater	EF 0.77	X	X	X	X
Water Heating	Water Heater	EF .86 (Condensing)	X	X	X	X
Appliances	Clothes Dryer	Baseline (EF .963)	X	X	X	X
Appliances	Clothes Dryer	Baseline (EF 1.013 AHAM)	X	X	X	X
Appliances	Clothes Dryer	High Efficiency (EF 1.027)	X	X	X	X
Appliances	Stove	Baseline w/Pilot (EF .399)	X	X	X	X
Appliances	Stove	Baseline w/o Pilot (EF .399)	X	X	X	X
Appliances	Stove	High Efficiency (EF .42)	X	X	X	X
Miscellaneous	Pool Heater	Baseline (EF .78)	X	X	X	X
Miscellaneous	Pool Heater	High Efficiency (EF .82)	X	X	X	X
Miscellaneous	Pool Heater	Condensing (EF .90)	X	X	X	X
Miscellaneous	Pool Heater	Condensing w/Imp. HX (EF .95)	X	X	X	X
Miscellaneous	Miscellaneous	Miscellaneous	X	X	X	X

Table 5-2 Summary of Residential Non-equipment Measures

Measure	Single Family Existing	Single Family New Construction	Multi Family Existing	Multi Family New Construction	Mobile Home Existing	Multi Family New Construction	Low Income Existing	Low Income New Construction
Ducting - Repair and Sealing	X	X	X	X	X	X	X	X
Thermostat - Clock/Programmable	X	X	X	X	X	X	X	X
Household - Weatherization	X		X		X		X	
Insulation - Ducting (Good)	X	X	X	X	X	X	X	X
Insulation - Ducting (Better)	X	X	X	X	X	X	X	X
Insulation - Ducting (Best)	X	X	X	X	X	X	X	X
Insulation - Ceiling (Good)	X	X	X	X	X	X	X	X
Insulation - Ceiling (Better)	X	X	X	X	X	X	X	X
Insulation - Ceiling (Best)	X	X	X	X	X	X	X	X
Insulation - Attic Hatch (Good)	X	X	X	X	X	X	X	X
Insulation - Attic Hatch (Better)	X	X	X	X	X	X	X	X
Insulation - Attic Hatch (Best)	X	X	X	X	X	X	X	X
Insulation - Hydronic Pipe Wrap	X	X	X	X	X	X	X	X
Roofs - High Reflectivity	X	X	X	X	X	X	X	X
Windows - Reflective Film	X	X	X	X	X	X	X	X
Windows - Energy Star	X	X	X	X	X	X	X	X
Water Heating - Faucet Aerators	X	X	X	X	X	X	X	X
Water Heating - Pipe Insulation	X	X	X	X	X	X	X	X
Water Heating - Low-Flow Showerheads	X	X	X	X	X	X	X	X
Water Heating - Tank Blanket	X	X	X	X	X	X	X	X
Water Heating - Thermostat Setback	X	X	X	X	X	X	X	X
Water Heating - Timer	X	X	X	X	X	X	X	X
Water Heating - Hot Water Saver	X	X	X	X	X	X	X	X
Home Energy Management System	X	X	X	X	X	X	X	X
Pool Pump - Timer	X	X	X	X	X	X	X	X
Insulation - Wall Cavity (Good)		X		X		X		X
Insulation - Wall Cavity (Better)		X		X		X		X
Insulation - Wall Cavity (Best)		X		X		X		X
Insulation - Foundation (Good)		X		X		X		X
Insulation - Foundation (Better)		X		X		X		X
Insulation - Foundation (Best)		X		X		X		X
Insulation - Wall Sheathing (Good)		X		X		X		X
Insulation - Wall Sheathing (Better)		X		X		X		X
Insulation - Wall Sheathing (Best)		X		X		X		X
Water Heating - Drainwater Heat Recovery		X		X		X		X
Construction - Energy Star Home (Good)		X		X		X		X
Construction - Energy Star Home (Better)		X		X		X		X
Construction - Energy Star Home (Best)		X		X		X		X
Construction - Advanced Design		X		X		X		X
Furnace - Maintenance	X	X	X	X	X	X	X	X
Boiler - Hot Water Reset	X	X	X	X	X	X	X	X
Boiler - Pipe Insulation	X	X	X	X	X	X	X	X

Table 5-3 Summary of Commercial Equipment Measures

End Use	Technology	Efficiency Option
Space Heating	Furnace	EF .76
Space Heating	Furnace	EF .80
Space Heating	Furnace	EF .81
Space Heating	Furnace	EF .82
Space Heating	Furnace	EF .90
Space Heating	Furnace	EF .91
Space Heating	Boiler	EF .76
Space Heating	Boiler	EF .80
Space Heating	Boiler	EF .82
Space Heating	Boiler	EF .85
Space Heating	Boiler	EF .96
Water Heating	Water Heater	EF .77
Water Heating	Water Heater	EF .80
Water Heating	Water Heater	EF .94
Water Heating	Water Heater	Tankless
Water Heating	Water Heater	Indirect Fired Water Heater
Food Preparation	Broiler	Standard
Food Preparation	Griddle	Standard
Food Preparation	Griddle	High Efficiency
Food Preparation	Range	Standard
Food Preparation	Range	High Efficiency
Food Preparation	Steamer	Standard
Food Preparation	Steamer	Energy Star
Miscellaneous	Pool Heater	Baseline (EF .78)
Miscellaneous	Pool Heater	High Efficiency (EF .82)
Miscellaneous	Pool Heater	Condensing (EF .90)
Miscellaneous	Pool Heater	Condensing w/Imp. HX (EF .95)
Miscellaneous	Miscellaneous	Miscellaneous

Table 5-4 Summary of Commercial Non-equipment Measures

Measure	Existing Buildings	New Buildings
Gas Furnace - Maintenance	x	x
Gas Boiler - Hot Water Reset	x	x
Gas Boiler - High Efficiency Hot Water Circulation	x	x
Insulation - Ducting (Good)	x	x
Insulation - Ducting (Better)	x	x
Insulation - Ducting (Best)	x	x
Insulation - Ceiling (Good)	x	x
Insulation - Ceiling (Better)	x	x
Insulation - Ceiling (Best)	x	x
Insulation - Wall Cavity (Good)	x	x
Insulation - Wall Cavity (Better)	x	x
Insulation - Wall Cavity (Best)	x	x
Ducting - Repair and Sealing	x	x
Energy Management System	x	x
Thermostat - Clock/Programmable	x	x
Roofs - High Reflectivity	x	x
Windows - High Efficiency	x	x
Water Heating - Faucet Aerators	x	x
Water Heating - Pipe Insulation	x	x
Water Heating - Tank Blanket	x	x
Water Heating - Hot Water Saver	x	x
Pool Pump - Timer	x	x
Space Heating - Heat Recovery Ventilator	x	x
Comprehensive Retrocommissioning	x	
Custom Measures	x	x
Water Heating - Drainwater Heat Recovery		x
Comprehensive Commissioning		x
Advanced New Construction Designs		x

Table 5-5 Summary of Industrial Measures

Measure	Other Industrial Existing	Other Industrial New	Semiconductor Existing	Semiconductor New	Oil and Petroleum Existing	Oil and Petroleum New
HVAC - Duct Insulation	X	X	X	X		
HVAC - Duct Repair and Sealing	X	X	X	X		
Energy Management System	X	X	X	X		
Clock/Programmable Thermostat	X	X	X	X		
Insulation - Ceiling	X	X	X	X		
Insulation - Wall Cavity	X	X	X	X		
Roofs - High Reflectivity	X	X	X	X		
Boiler - High Efficiency	X	X	X	X		
Furnace - High Efficiency	X	X	X	X		
Furnace - Maintenance	X	X	X	X		
Boiler - Hot Water Reset	X	X	X	X		
Process - Reduce Drag out			X	X		
Process - Counter Flow Rinsing			X	X		
Process - Use Flow restrictors			X	X		
Process - Timers and Controls			X	X		
Process - Conductivity Controls			X	X		
Process - Reduce use of compressed air			X	X		
Process - Compressed Air System Controls	X	X	X	X		
Process - Compressed Air System Optimization and Improvements	X	X	X	X		
Process - Compressed Air System Maintenance	X	X	X	X		
Process - Compressor Replacement	X	X	X	X		
Process - Controls on Fume Hoods			X	X		
Process - Sequence air compressors			X	X		
Process - Install New Air Compressor			X	X		
Variable Speed Drive for ESP Pumping Units					X	X
Pump Off Controllers for Rod Beam Pumping Unit					X	X
Well Conversion to Progressing Cavity Pump					X	X
Well Conversion, Gas Lift to Rod Beam with POC					X	X
Process Optimization of pump retrofit					X	X
Variable Speed Drive for Steam Generator Feedwater Pump and/or F					X	X
Variable Speed Drive for Positive Displacement Pump					X	X
Variable Speed Drive for Gas Compressor					X	X
Decreasing water/oil ratio					X	X
VSDs for surface motors					X	X
Smart Well					X	X

5.2 RESULTS OF THE ECONOMIC SCREEN

Table 5-6 summarizes the number of equipment and non-equipment measures evaluated for each segment within each sector.

Table 5-6 Number of Measures Evaluated

	Residential	Commercial	Industrial	Total Number of Measures
Equipment Measures Evaluated	31	32	2	65
Non-Equipment Measures Evaluated	38	25	8	71
Total Measures Evaluated	**69**	**57**	**10**	**136**

Volume 7 summarizes the economic screening process by segment, vintage, end use and measure for the residential sector. Volume 7 shows the equivalent information for the commercial and industrial sectors.

ENERGY EFFICIENCY POTENTIAL RESULTS

This chapter presents the results of the energy-efficiency analysis. First, the overall potential is presented, followed by results for each sector.

6.1 OVERALL NATURAL GAS ENERGY EFFICIENCY POTENTIAL

Table 6-1 presents the baseline forecasts of energy consumption, as well as the four levels of energy-efficiency potential across sectors. As discussed in detail in Chapter 4, the baseline forecast across all sectors increases over the 16-year time period. This is due largely to the growth in the industrial and residential sectors which are tempered somewhat due to appliance and equipment standards, building codes and a sluggish economy. Key findings related to potentials are summarized below.

- ***Achievable - Low potential*** across all sectors is 0.5 MMTh in 2012 and increases to 27.7 MMTh by 2025. This represents 0.1% of the baseline forecast in 2012 and 3% in 2025. By 2025, Achievable – Low offsets 16% of the growth in the baseline forecast.
- ***Achievable - High potential*** is 1.9 MMTh in 2012, which represents 0.3% of the baseline forecast. By 2025, the cumulative savings are 80.5 MMTh, 8.8% of the baseline forecast, for an annual average of just under 0.7% per year. By 2025, Achievable – High offsets 46% of the growth in the baseline forecast.
- ***Economic potential***, which reflects the savings when all cost-effective measures are taken, is 4.3 MMTh in 2012. This represents 0.6% of the baseline energy forecast. By 2025, economic potential reaches 108.5 MMTh, 11.7% of the baseline energy forecast.
- ***Technical potential*** which reflects the adoption of all energy efficiency measures regardless of cost is a theoretical upper bound on savings. In 2012, energy savings are 7.6 MMTh, or 1.0% of the baseline energy forecast. By 2025, technical potential reaches 179.2 MMTh, 19.5% of the baseline energy forecast.

Figure 6-1 summarizes the energy-efficiency savings for the four levels of potential relative to the baseline forecast. Figure 6-2 displays the energy-efficiency forecasts[9].

[9] Annual savings are shown in Volume 7 TK.

Table 6-1 Summary of Energy Efficiency Potential

Forecasts (MMTh)	**2012**	**2015**	**2020**	**2025**
Baseline Forecast	742	787	852	917
Savings (MMTh)				
Achievable Low	0.5	2.4	11.1	27.7
Achievable High	1.9	8.3	34.0	80.5
Economic	4.3	17.0	52.7	108.5
Technical	7.6	31.3	91.4	179.2
Savings (% of Baseline)				
Achievable Low	0.1%	0.3%	1.3%	3.0%
Achievable High	0.3%	1.1%	4.0%	8.8%
Economic	0.6%	2.2%	6.2%	11.8%
Technical	1.0%	4.0%	10.7%	19.5%

Figure 6-1 Summary of Potential Energy Savings

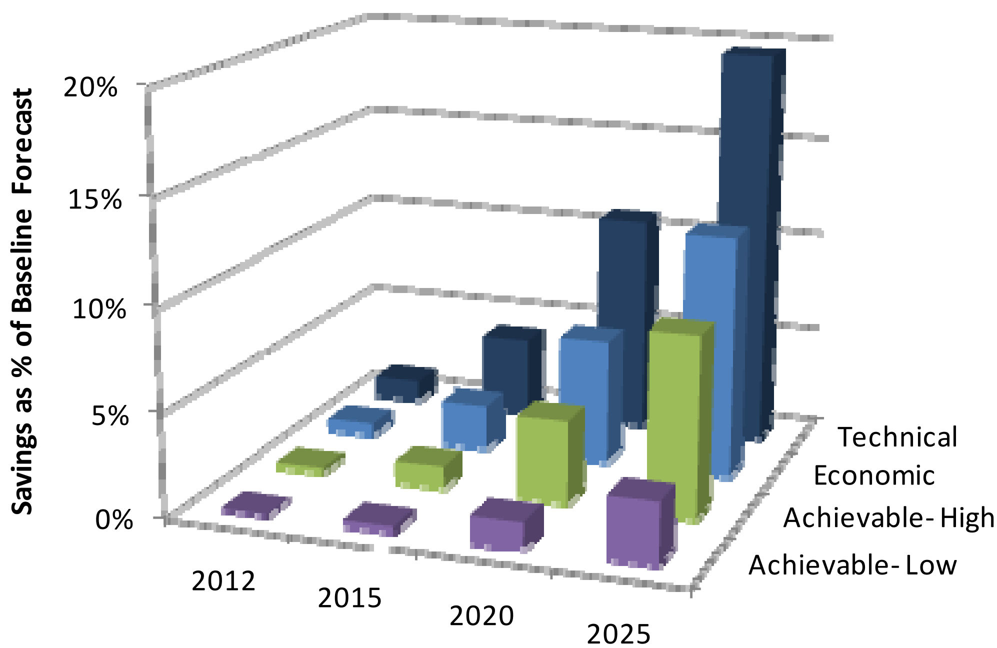


Figure 6-2 Energy Efficiency Potential Energy Forecasts (MMTh)

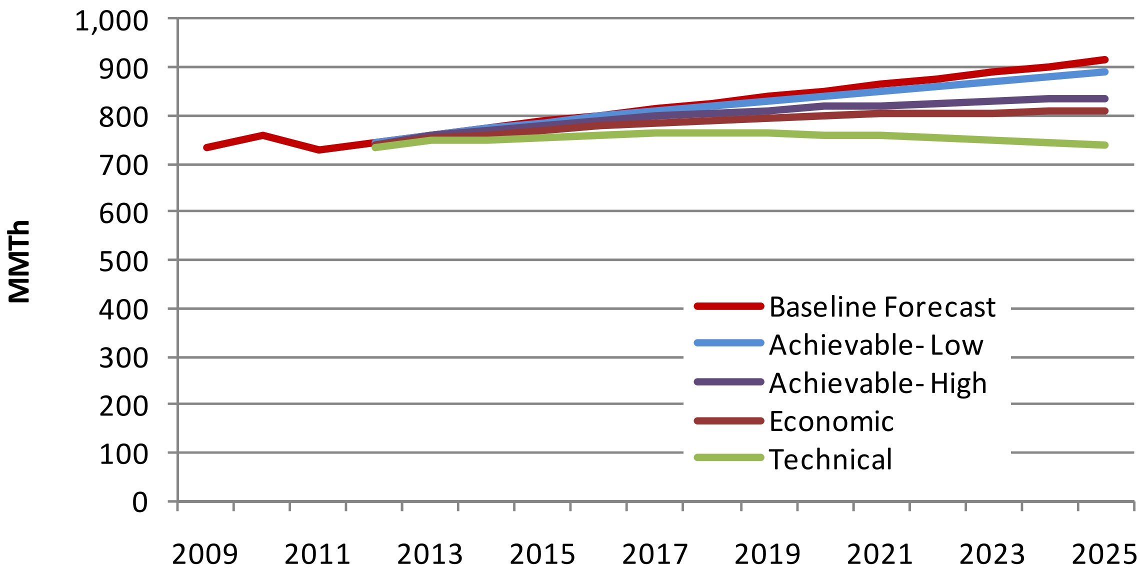


Table 6-2 and Figure 6-3 summarize the range of achievable potential by sector. The residential sector accounts for the largest portion of the savings — about 71% of the Achievable - Low potential in 2025 and 77% of the Achievable - High potential in 2025.

Table 6-2 Achievable Energy Efficiency Potential by Sector (MMTh)

	2012	2015	2020	2025
Achievable - Low Savings (MMTh)				
Residential	0.2	0.9	6.8	19.5
Commercial	0.3	1.5	4.1	7.7
Industrial	0.0	0.0	0.2	0.6
Total	**0.5**	**2.4**	**11.1**	**27.7**
Achievable - High Savings (MMTh)				
Residential	0.9	4.2	23.4	61.5
Commercial	1.0	4.1	10.2	17.6
Industrial	0.0	0.1	0.4	1.4
Total	**1.9**	**8.3**	**34.0**	**80.5**

Figure 6-3 Achievable Potential by Sector, 2025

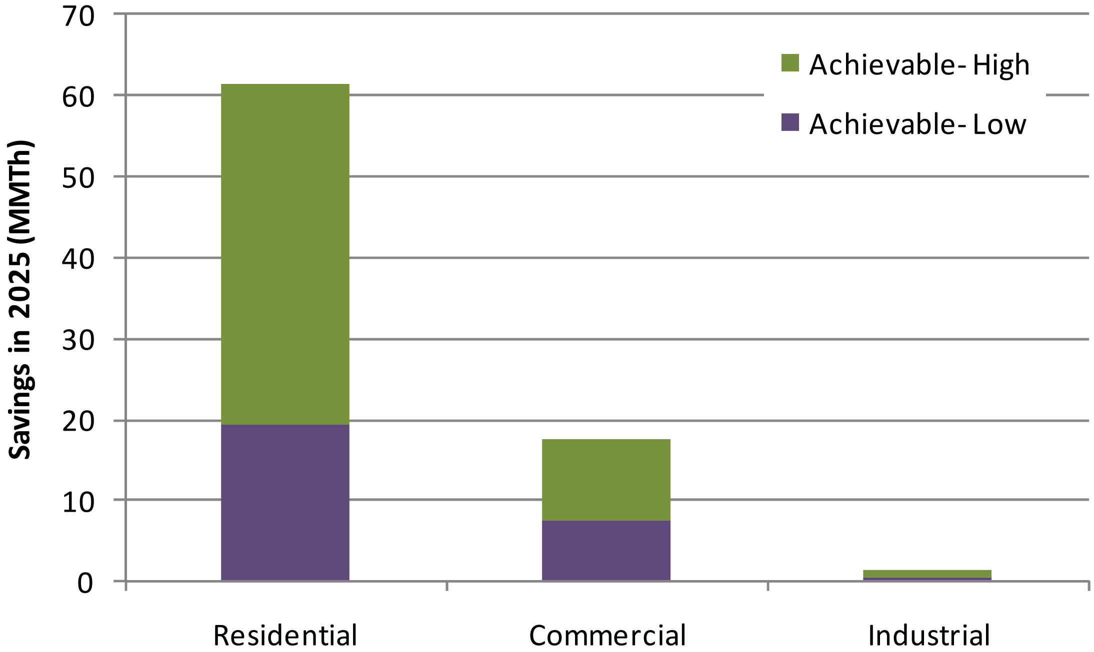


Table 6-3 presents estimates of potential for each entity in the state. These estimates represent the sum of the sector-level estimates for each entity.

Table 6-3 Efficiency Potential by Entity (MMTh)

Utility	Type	2012	2015	2020	2025
IOUs					
New Mexico Gas Company	Achievable - Low	0.427	2.038	9.426	23.726
	Achievable - High	1.618	7.070	29.055	69.073
	Economic	3.630	14.386	44.848	92.740
Non IOU					
City of Las Vegas Nat Gas Dept	Achievable - Low	0.007	0.035	0.136	0.313
	Achievable - High	0.025	0.112	0.389	0.855
	Economic	0.058	0.235	0.652	1.243
City of Los Alamos	Achievable - Low	0.007	0.033	0.172	0.453
	Achievable - High	0.028	0.122	0.553	1.361
	Economic	0.062	0.244	0.819	1.757
City of Socorro	Achievable - Low	0.003	0.014	0.057	0.137
	Achievable - High	0.010	0.046	0.171	0.386
	Economic	0.024	0.095	0.275	0.541
DCP Midstream	Achievable - Low	0.000	0.001	0.009	0.032
	Achievable - High	0.002	0.005	0.023	0.076
	Economic	0.003	0.008	0.033	0.108
Deming Gas System	Achievable - Low	0.005	0.025	0.092	0.206
	Achievable - High	0.019	0.079	0.265	0.565
	Economic	0.042	0.166	0.447	0.833
Eastern New Mexico Natural Gas	Achievable - Low	0.001	0.003	0.014	0.035
	Achievable - High	0.002	0.011	0.043	0.101
	Economic	0.006	0.022	0.068	0.137
El Paso Natural Gas	Achievable - Low	0.000	0.001	0.004	0.014
	Achievable - High	0.001	0.002	0.010	0.033
	Economic	0.001	0.004	0.015	0.047
EMW Gas Association	Achievable - Low	0.004	0.019	0.097	0.253
	Achievable - High	0.015	0.068	0.304	0.748
	Economic	0.034	0.137	0.455	0.973
Las Cruces Municipal Gas	Achievable - Low	0.017	0.079	0.325	0.777
	Achievable - High	0.062	0.262	0.977	2.219
	Economic	0.137	0.537	1.564	3.096
Natural Gas Pipeline Company of America	Achievable - Low	0.000	0.000	0.002	0.008
	Achievable - High	0.000	0.001	0.006	0.019
	Economic	0.001	0.002	0.009	0.028
Navajo Tribal Utility Authority	Achievable - Low	0.005	0.021	0.074	0.163
	Achievable - High	0.015	0.064	0.203	0.426
	Economic	0.034	0.136	0.355	0.655

Utility	Type	2012	2015	2020	2025
Raton Natural Gas	Achievable - Low	0.003	0.017	0.089	0.231
	Achievable - High	0.014	0.063	0.278	0.680
	Economic	0.031	0.127	0.418	0.889
Rio Grande Natural Gas	Achievable - Low	0.010	0.046	0.193	0.464
	Achievable - High	0.036	0.154	0.587	1.340
	Economic	0.080	0.315	0.930	1.848
Town of Mountainair	Achievable - Low	0.000	0.001	0.011	0.030
	Achievable - High	0.001	0.006	0.035	0.093
	Economic	0.003	0.013	0.049	0.114
Village of Corona	Achievable - Low	0.000	0.001	0.002	0.006
	Achievable - High	0.000	0.002	0.007	0.016
	Economic	0.001	0.004	0.011	0.022
Village of Hatch	Achievable - Low	0.001	0.004	0.015	0.033
	Achievable - High	0.003	0.013	0.043	0.091
	Economic	0.007	0.027	0.072	0.135
Wagon Mound Gas System	Achievable - Low	0.000	0.000	0.003	0.009
	Achievable - High	0.000	0.002	0.011	0.028
	Economic	0.001	0.004	0.014	0.034
Zia Natural Gas	Achievable - Low	0.017	0.078	0.337	0.818
	Achievable - High	0.062	0.266	1.036	2.385
	Economic	0.139	0.542	1.626	3.259
Total	**Achievable - Low**	**0.51**	**2.42**	**11.06**	**27.71**
	Achievable - High	**1.91**	**8.35**	**34.00**	**80.50**
	Economic	**4.29**	**17.00**	**52.66**	**108.46**

6.2 NATURAL GAS RESIDENTIAL SECTOR

Table 6-4 presents estimates for the four types of potential. Figure 6-4 depicts the potential energy savings estimates graphically.

- ***Achievable - Low potential*** projects 0.2 MMTh of energy savings in 2012, 0.1% of the baseline forecast. This increases to 19.5 MMTh, 4.5% of the baseline forecast, in 2025.
- ***Achievable - High potential*** is 0.9 MMTh in 2012, which represents 0.3% of the baseline forecast. By 2025, the cumulative energy savings are 61.5 MMTh, 14.1% of the baseline forecast.
- ***Economic potential***, which reflects the savings when all cost-effective measures are taken, is 2.0 MMTh in 2012. This represents 0.6% of the baseline energy forecast. By 2025, economic potential reaches 74.3 MMTh, 17.0% of the baseline energy forecast.
- ***Technical potential*** which reflects the adoption of all energy efficiency measures regardless of cost is a theoretical upper bound on savings. In 2012, energy savings are 4.8 MMTh, or 1.5% of the baseline energy forecast. By 2025, technical potential reaches 132.1 MMTh, 30.3% of the baseline energy forecast.

Figure 6-5 shows the forecasts under the four types of potential along with the baseline forecast.

Table 6-4 Natural Gas Energy Efficiency Potential for the Residential Sector

	2012	2015	2020	2025
Baseline Forecast (MMTh)	328	352	393	437
Energy Savings (MMTh)				
Achievable - Low	0.2	0.9	6.8	19.5
Achievable - High	0.9	4.2	23.4	61.5
Economic	2.0	7.9	31.9	74.3
Technical	4.8	20.5	64.4	132.1
Energy Savings (% of Baseline)				
Achievable - Low	0.1%	0.3%	1.7%	4.5%
Achievable - High	0.3%	1.2%	6.0%	14.1%
Economic	0.6%	2.3%	8.1%	17.0%
Technical	1.5%	5.8%	16.4%	30.3%

Figure 6-4 Residential Energy Efficiency Potential Savings

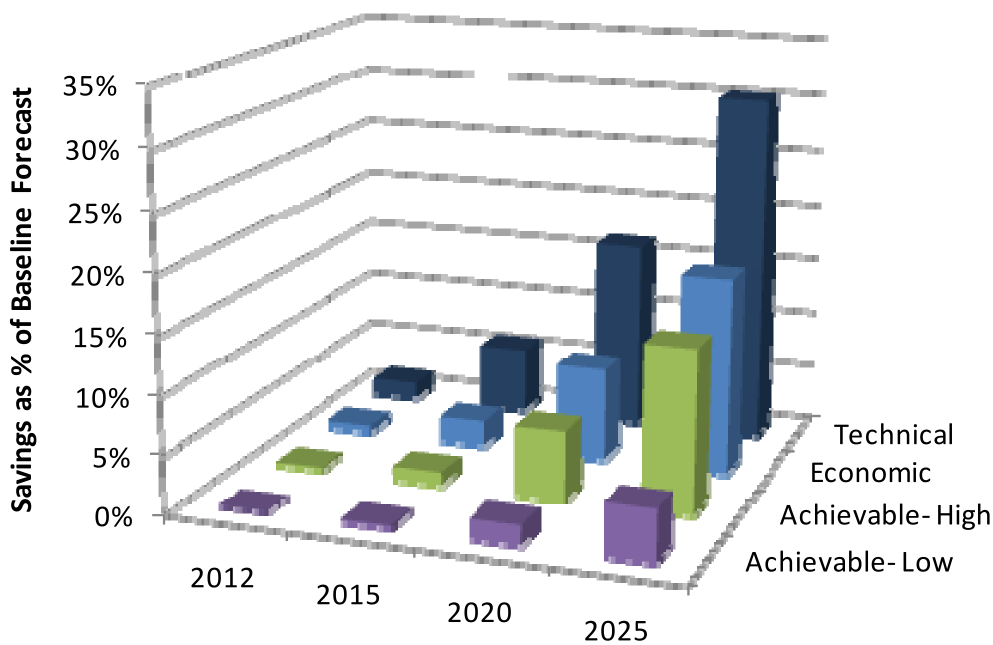
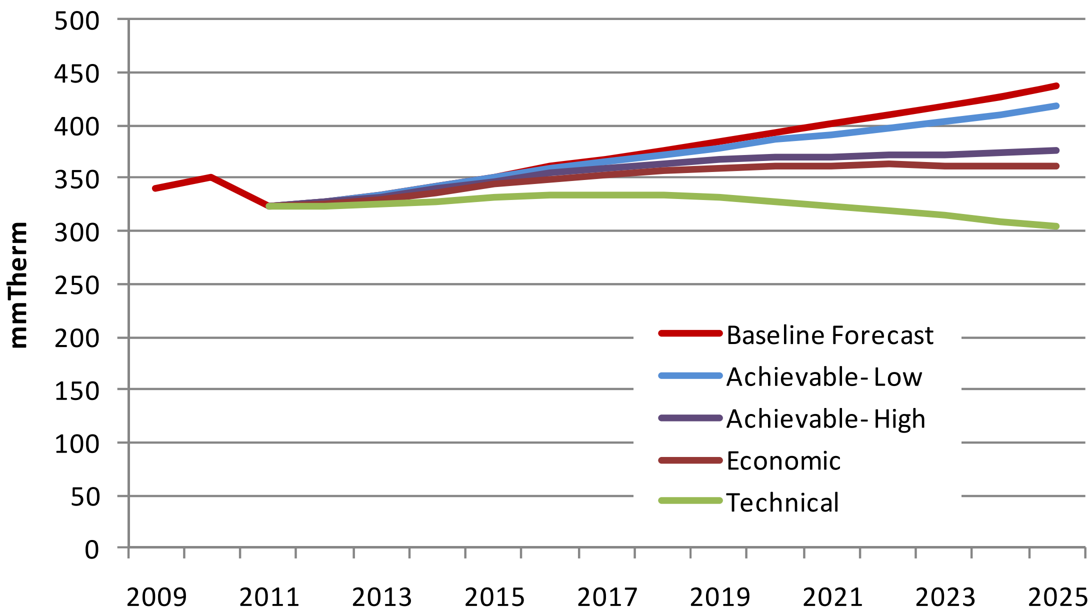


Figure 6-5 Residential Energy Efficiency Potential Forecast



6.2.1 Residential Potential by Market Segment

Single-family homes in New Mexico account for almost half of this sector's total sales in the base year and throughout the forecast. Similarly, single-family homes account for the largest share of potential savings by segment, displayed in Table 6-5.

Table 6-6 shows the savings by end use and market segment. The segments are similar in terms of the savings opportunities by end use, but there are a few notable differences. Single-family homes are larger and so have more savings potential from the space heating end use. Similarly, single-family homes have more potential for savings for water heating. Low income has a relatively larger opportunity in space heating compared to the other segments, reflecting older appliance age.

Table 6-5 Residential Potential by Market Segment, 2025

	Single Family	Multi Family	Mobile Home	Low Income	Total
Baseline Forecast	217	38	24	158	437
Energy Savings (MMTh)					
Achievable - Low	9	2	1	8	19
Achievable - High	29	5	4	24	62
Economic	35	6	5	29	74
Technical	63	13	8	49	132
Energy Savings (% of Baseline)					
Achievable - Low	0.1%	0.3%	1.7%	4.5%	0.1%
Achievable - High	0.3%	1.2%	6.0%	14.1%	0.3%
Economic	0.6%	2.3%	8.1%	17.0%	0.6%
Technical	1.5%	5.8%	16.4%	30.3%	1.5%

Table 6-6 Residential Achievable Potential by End Use and Market Segment, 2025

Range of Achievable Energy Savings (MMTh)	Single Family	Multi Family	Mobile Home	Low Income	Total
Space Heating	7-20	1-3	1-3	6-18	**15-44**
Water Heating	2-9	1-2	0-1	1-6	**5-18**
Appliances	0-0	0-0	0-0	0-0	**0-0**
Miscellaneous	0-0	0-0	0-0	0-0	**0-0**
Total	**9-29**	**2-5**	**1-4**	**8-24**	**19-62**

6.2.2 Residential Potential by End Use, Technology and Measure Type

Table 6-7 provides estimates of savings for each end use and type of potential. Focusing first on technical and economic potential, there are significant savings that are both possible and economic in numerous end uses:

- ***Space heating*** offers the largest potential savings. This is a result of the adoption of higher efficiency furnaces and boilers. In the technical potential case all customers purchase the most efficient furnace with an EF of .96. However, these are not cost-effective until midway through the forecast period. The achievable case reflects more households purchasing the minimum standard of EF .80.
- ***Water heating*** is the second-largest in terms of savings. Technical potential reflects the purchase of water heaters with Condensing units with EF .86. However, this option is not cost-effective during the forecast horizon. The achievable savings reflect customer preference to purchase the standard efficiency or slightly more efficient options.

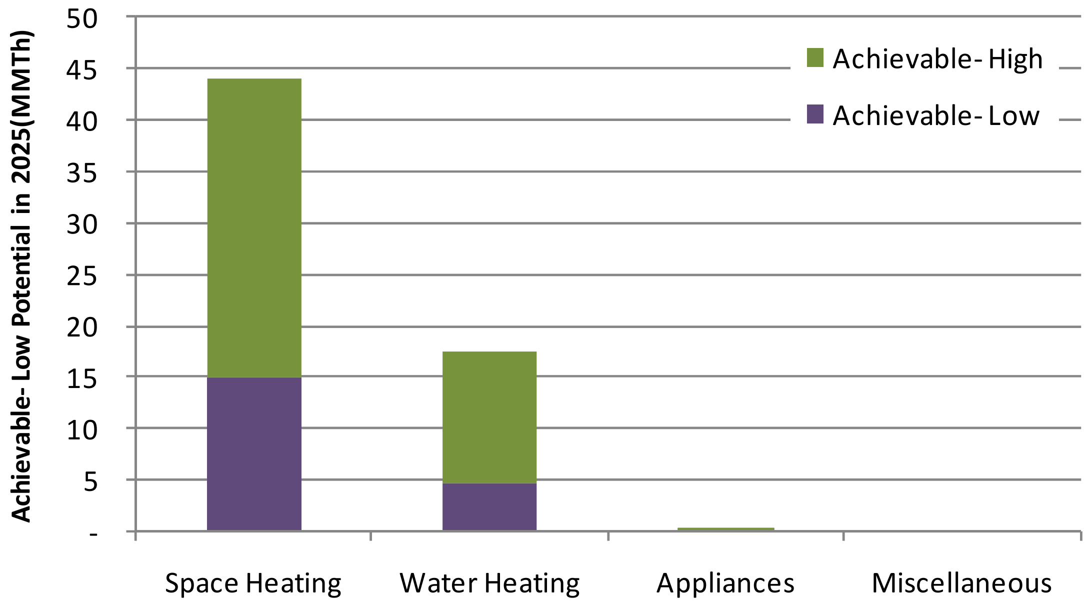
Table 6-7 Residential Savings by End Use and Potential Type (MMTh)

End Use	Case	2012	2015	2020	2025
Space Heating	Achievable - Low	0.07	0.64	5.01	14.87
	Achievable - High	0.41	2.69	16.03	43.94
	Economic	1.11	5.52	22.40	53.30
	Technical	2.28	11.22	39.33	86.05
Water Heating	Achievable - Low	0.04	0.22	1.70	4.58
	Achievable - High	0.31	1.27	7.16	17.57
	Economic	0.60	2.07	9.13	20.98
	Technical	2.22	8.81	24.41	45.46
Appliances	Achievable - Low	0.07	0.07	0.07	0.01
	Achievable - High	0.21	0.21	0.21	0.04
	Economic	0.32	0.33	0.32	0.06
	Technical	0.33	0.43	0.55	0.43
Miscellaneous	Achievable - Low	-	-	-	-
	Achievable - High	-	-	-	-
	Economic	-	-	-	-
	Technical	0.01	0.05	0.11	0.17
Total	**Achievable - Low**	**0.2**	**0.9**	**6.8**	**19.5**
	Achievable - High	**0.9**	**4.2**	**23.4**	**61.5**
	Economic	**2.0**	**7.9**	**31.9**	**74.3**
	Technical	**4.8**	**20.5**	**64.4**	**132.1**

Figure 6-6 focuses on the range of achievable potential between Achievable - High and Achievable - Low.

- Space heating accounts for the largest savings since higher levels of efficiency for furnaces, compared to the standard, are cost-effective throughout the forecast period. Additional building shell measures contribute to the savings.
- Water heating also contributes significantly to the savings with cost-effective high efficiency water heaters.

Figure 6-6 Residential Achievable Potential by End Use in 2025



As described in Chapter 4, using our LoadMAP model, we develop separate estimates of potential for equipment and non-equipment measures. Table 6-8 presents results for equipment at the technology level and Table 6-9 presents non-equipment measures for which Achievable - Low potential is greater than zero. The majority of the savings come from the equipment measures, with space heating and water heating leading the way. There are some savings from appliances, as well.

Table 6-8 Residential Achievable - Low Potential by Equipment Technology – Selected years (MMTh)

End Use	Technology	2012	2015	2020	2025
Space Heating	Boiler (Radiant)	-	-	-	-
	Boiler (Radiator)	-	-	-	-
	Furnace	0.1	0.5	2.7	6.1
Water Heating	Water Heater	0.0	0.1	0.2	0.2
Appliances	Clothes Dryer	-	-	-	-
	Stove	0.1	0.1	0.1	0.0
Miscellaneous	Miscellaneous	-	-	-	-
	Pool Heater	-	-	-	-
Subtotal	**Equipment**	**0.2**	**0.7**	**2.9**	**6.3**
Total	**Equipment and Non-Equipment measures**	**0.2**	**0.9**	**6.8**	**19.5**

Table 6-9 Residential Achievable - Low Savings for Non-equipment Measures (MMTh)

Measure	2012	2015	2020	2025
Thermostat - Clock/Programmable	0.01	0.05	0.74	2.42
Insulation - Wall Cavity (Good)	0.00	0.02	0.39	2.03
Insulation - Ceiling (Good)	0.00	0.02	0.34	1.64
Water Heating - Low-Flow Showerheads	0.01	0.03	0.41	1.21
Water Heating - Tank Blanket	0.01	0.04	0.56	1.16
Ducting - Repair and Sealing	0.00	0.03	0.50	1.01
Water Heating - Thermostat Setback	0.00	0.02	0.27	0.97
Home Energy Management System	0.00	0.01	0.19	0.86
Construction - Advanced Design	0.00	0.00	0.08	0.48
Water Heating - Faucet Aerators	0.00	0.01	0.15	0.47
Insulation - Foundation (Good)	0.00	0.00	0.06	0.30
Water Heating - Timer	0.00	0.01	0.06	0.25
Water Heating - Hot Water Saver	0.00	0.00	0.04	0.19
Household - Weatherization	0.00	0.00	0.03	0.11
Water Heating - Pipe Insulation	0.00	0.00	0.01	0.04
Insulation - Wall Sheathing (Better)	0.00	0.00	0.01	0.03
Insulation - Attic Hatch (Good)	0.00	0.00	0.00	0.02
Subtotal Non-Equipment Measures	**0.03**	**0.26**	**3.85**	**13.18**
Total Achievable- Low	**0.2**	**0.9**	**6.8**	**19.5**

6.2.3 Residential Potential by Entity

Table 6-10 presents the residential sector potential for each entity in the state. These estimates were developed by taking the total end-use estimates for the state and allocating them to each entity according to its share of total residential natural gas use. Then, these estimates were adjusted to reflect weather differences between the entity's area and the state as a whole.

Table 6-10 Residential Efficiency Potential by Entity (MMTh)

Utility	Type	2012	2015	2020	2025
IOUs					
New Mexico Gas Company	Achievable - Low	0.160	0.804	5.876	16.884
	Achievable - High	0.796	3.602	20.264	53.331
	Economic	1.761	6.858	27.596	64.419
Non IOU					
City of Las Vegas Nat Gas Dept	Achievable - Low	0.001	0.008	0.056	0.163
	Achievable - High	0.007	0.034	0.191	0.508
	Economic	0.016	0.065	0.262	0.614
City of Los Alamos	Achievable - Low	0.004	0.018	0.130	0.373
	Achievable - High	0.018	0.080	0.448	1.179
	Economic	0.039	0.152	0.610	1.424
City of Socorro	Achievable - Low	0.001	0.004	0.029	0.084
	Achievable - High	0.004	0.018	0.101	0.267
	Economic	0.009	0.034	0.138	0.322

Utility	Type	2012	2015	2020	2025
Deming Gas System	Achievable - Low	0.001	0.005	0.036	0.102
	Achievable - High	0.005	0.023	0.126	0.328
	Economic	0.011	0.042	0.170	0.396
Eastern New Mexico Natural Gas	Achievable - Low	0.000	0.001	0.008	0.024
	Achievable - High	0.001	0.005	0.029	0.076
	Economic	0.003	0.010	0.039	0.092
EMW Gas Association	Achievable - Low	0.002	0.009	0.070	0.203
	Achievable - High	0.009	0.042	0.238	0.632
	Economic	0.020	0.081	0.326	0.765
Las Cruces Municipal Gas	Achievable - Low	0.005	0.023	0.167	0.476
	Achievable - High	0.025	0.106	0.587	1.531
	Economic	0.053	0.198	0.795	1.847
Navajo Tribal Utility Authority	Achievable - Low	0.001	0.003	0.020	0.058
	Achievable - High	0.003	0.012	0.069	0.182
	Economic	0.006	0.023	0.094	0.220
Raton Natural Gas	Achievable - Low	0.002	0.009	0.063	0.183
	Achievable - High	0.008	0.038	0.215	0.570
	Economic	0.018	0.073	0.294	0.689
Rio Grande Natural Gas	Achievable - Low	0.003	0.015	0.106	0.303
	Achievable - High	0.016	0.067	0.374	0.975
	Economic	0.034	0.126	0.506	1.176
Town of Mountainair	Achievable - Low	0.000	0.001	0.010	0.029
	Achievable - High	0.001	0.006	0.035	0.092
	Economic	0.003	0.012	0.047	0.111
Village of Corona	Achievable - Low	0.000	0.000	0.001	0.004
	Achievable - High	0.000	0.001	0.005	0.012
	Economic	0.000	0.002	0.006	0.015
Village of Hatch	Achievable - Low	0.000	0.001	0.005	0.015
	Achievable - High	0.001	0.003	0.019	0.050
	Economic	0.002	0.006	0.026	0.060
Wagon Mound Gas System	Achievable - Low	0.000	0.000	0.003	0.009
	Achievable - High	0.000	0.002	0.011	0.028
	Economic	0.001	0.004	0.014	0.034
Zia Natural Gas	Achievable - Low	0.006	0.027	0.195	0.556
	Achievable - High	0.029	0.124	0.686	1.788
	Economic	0.062	0.231	0.929	2.158
Total	Achievable - Low	0.19	0.93	6.78	19.47
	Achievable - High	0.92	4.16	23.40	61.55
	Economic	2.04	7.92	31.85	74.34

6.3 COMMERCIAL SECTOR POTENTIAL

The baseline forecast for the commercial sector essentially remains flat, which reflects the sluggish economy, building codes and relatively efficient energy-use patterns. Nevertheless, the opportunity for energy-efficiency savings is still significant for the commercial sector.

- ***Achievable - Low potential*** projects 0.3 MMTh of energy savings in 2012 and 7.7 MMTh in 2025. This corresponds to 0.1% of the baseline forecast in 2012 and 3.2% in 2025.
- ***Achievable - High potential*** is 1.0 MMTh in 2012, which represents 0.4% of the baseline forecast. By 2025, the cumulative energy savings are 17.6 MMTh, 7.4% of the baseline forecast.
- ***Economic potential***, which reflects the savings when all cost-effective measures are taken, is 2.2 MMTh in 2012. This represents 1.0% of the baseline energy forecast. By 2025, economic potential reaches 32.2 MMTh, 13.5% of the baseline energy forecast.
- ***Technical potential*** which reflects the adoption of all energy efficiency measures regardless of cost is a theoretical upper bound on savings. In 2012, energy savings are 2.7 MMTh, or 1.2% of the baseline energy forecast. By 2025, technical potential reaches 43.1 MMTh, 18.1% of the baseline energy forecast.

Table 6-11 and Figure 6-7 present the savings associated with each level of potential. Figure 6-8 presents the forecasts for each type of potential and the baseline forecast.

Table 6-11 Energy Efficiency Potential for the Commercial Sector

Forecasts (MMTh)	2012	2015	2020	2025
Baseline Forecast	214	219	228	238
Savings (MMTh)				
Achievable - Low	0.3	1.5	4.1	7.7
Achievable - High	1.0	4.1	10.2	17.6
Economic	2.2	8.9	20.2	32.2
Technical	2.7	10.5	25.8	43.1
Savings (% of Baseline)				
Achievable - Low	0.1%	0.7%	1.8%	3.2%
Achievable - High	0.4%	1.9%	4.5%	7.4%
Economic	1.0%	4.1%	8.8%	13.5%
Technical	1.2%	4.8%	11.3%	18.1%

Figure 6-7 Commercial Energy Efficiency Potential Savings

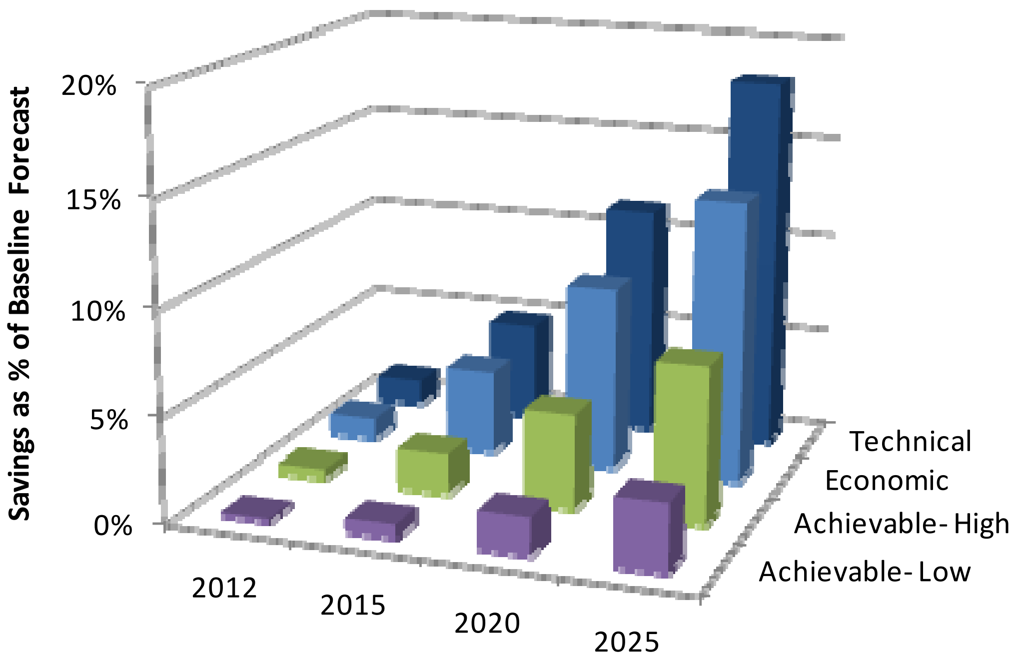
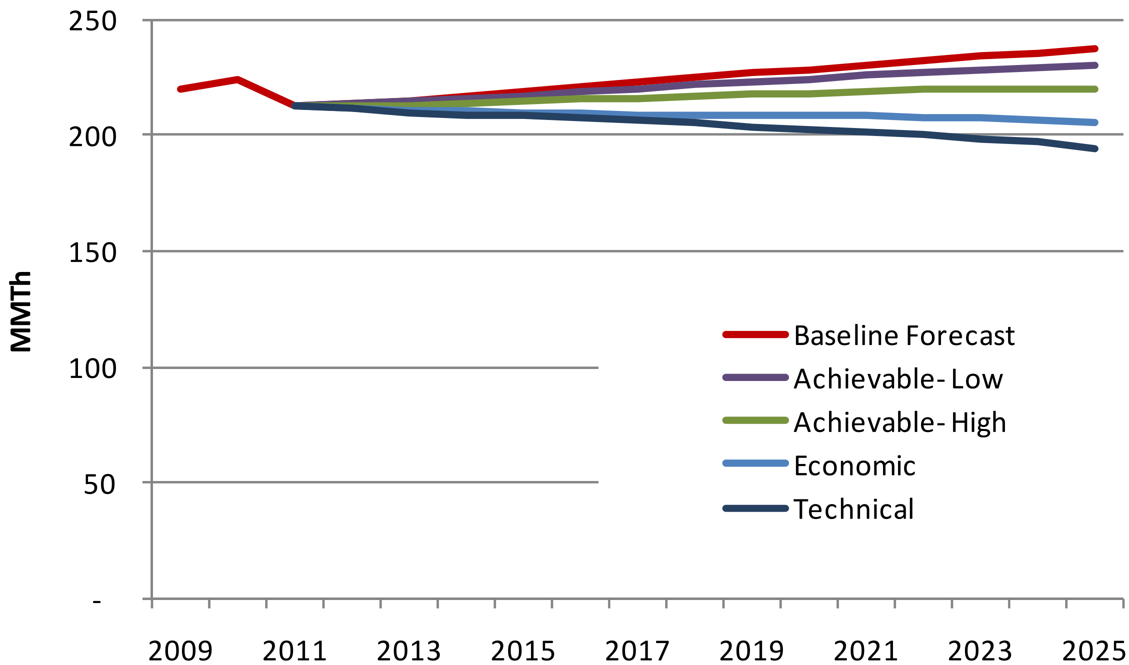


Figure 6-8 Commercial Energy Efficiency Potential Forecast



6.3.1 Commercial Potential by Market Segment

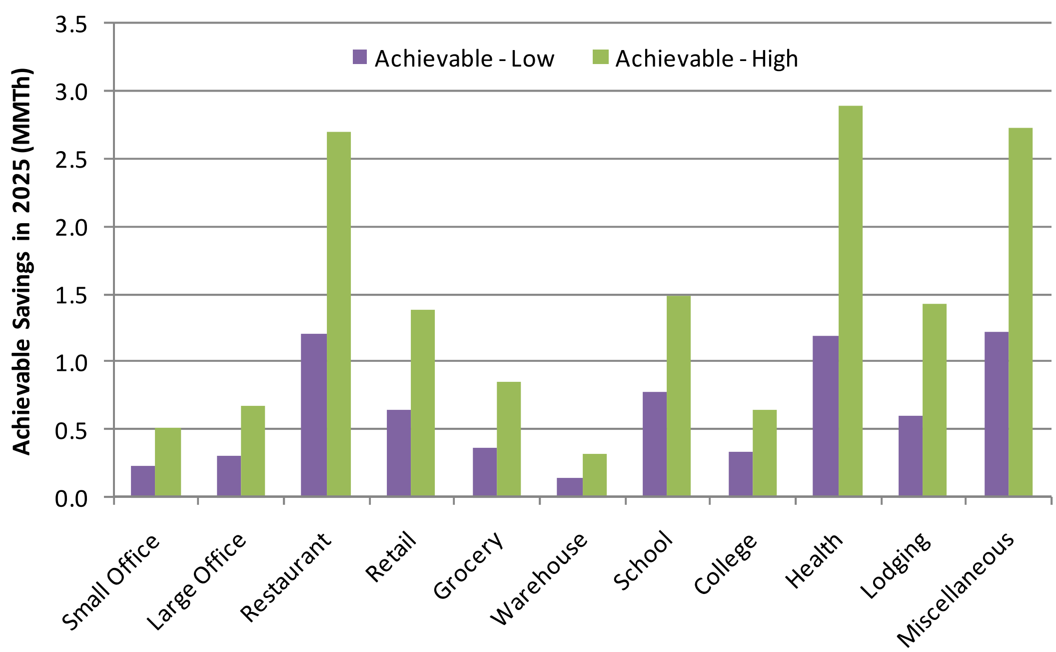
Table 6-12 shows potential estimates by segment. Health has the largest savings potential in 2025 with a range of achievable savings of 1.3MMTh to 3.2 MMTh. The Restaurant segment is close behind with a range of achievable savings of 1.9MMTh to 2.9 MMTh. The achievable savings for health are 17% of the overall commercial Achievable - Low potential and 18% of the commercial Achievable - High potential.

Table 6-12 Commercial Potential by Market Segment, 2025

Segment	Achievable - Low	Achievable - High	Economic	Technical
Small Office	0.3	0.6	1.1	2.0
Large Office	0.3	0.8	1.4	2.2
Restaurant	1.3	2.9	4.7	5.0
Retail	0.9	2.2	3.7	4.3
Grocery	0.4	1.0	1.8	2.0
Warehouse	0.2	0.4	0.7	2.3
School	0.8	1.5	3.0	4.1
College	0.4	0.7	1.4	2.0
Health	1.3	3.2	6.4	7.2
Lodging	0.6	1.5	2.6	3.0
Miscellaneous	1.2	2.8	5.4	9.1
Total	**7.7**	**17.6**	**32.2**	**43.1**

Figure 6-9 focuses on the range of achievable potential for each segment. The Health segment has the largest potential, followed by restaurants, miscellaneous, and retail.

Figure 6-9 Achievable Potential Savings in 2025 by Commercial Building Type (MMTh)



6.3.2 Commercial Potential by End Use, Technology, and Measure Type

Table 6-13 presents the commercial sector savings by end use and potential type. The end uses with the highest technical and economic potential are:

- Water heating, due to increasingly efficient water heaters has the highest technical potential at 21.6 MMTh in 2025. Indirect fired water heaters are cost-effective starting in 2012 and are slowly adopted under the achievable case. The range for achievable potential from water heating is 4.8 MMTh to 10.8 MMTh in 2025.
- Space heating has the second-highest technical potential savings with 14.6 MMTh in 2025. This assumes that all businesses adopt the highest level of efficiency for furnaces (EF .91) and boilers (EF .96). Under the achievable cases, more customers will adopt less efficient technologies that are the minimum standard.
- Food preparation has the third-most technical potential savings with 6.7 MMTh in 2025, but has the second-highest level of achievable savings. With more efficient cooking appliances, Achievable - Low in 2025 reaches 1.7 MMTh and Achievable - High reaches 3.6 MMTh.

Figure 6-10, Table 6-14, and Table 6-15 focus on achievable potential savings. Figure 6-10 compares the range of potential in 2025. Not surprisingly, water heating delivers the highest achievable savings. Food preparation is next highest, closely followed by water heating.

Table 6-13 Commercial Potential by End Use and Potential Type (MMTh)

End Use	Case	2012	2015	2020	2025
Space Heating	Achievable - Low	0.0	0.1	0.5	1.2
	Achievable - High	0.1	0.4	1.4	3.1
	Economic	0.2	0.8	2.4	4.8
	Technical	0.6	2.2	7.3	14.6
Water Heating	Achievable - Low	0.2	0.9	2.5	4.8
	Achievable - High	0.6	2.5	6.2	10.8
	Economic	1.3	5.6	12.6	20.6
	Technical	1.3	5.7	13.1	21.6
Food Preparation	Achievable - Low	0.1	0.4	1.1	1.7
	Achievable - High	0.3	1.2	2.6	3.6
	Economic	0.7	2.5	5.2	6.7
	Technical	0.7	2.5	5.2	6.7
Miscellaneous	Achievable - Low	0.0	0.0	0.0	0.0
	Achievable - High	0.0	0.0	0.0	0.0
	Economic	0.0	0.0	0.0	0.0
	Technical	0.0	0.0	0.1	0.2
Total	**Achievable - Low**	**0.3**	**1.5**	**4.1**	**7.7**
	Achievable - High	**1.0**	**4.1**	**10.2**	**17.6**
	Economic	**2.2**	**8.9**	**20.2**	**32.2**
	Technical	**2.7**	**10.5**	**25.8**	**43.1**

Figure 6-10 Commercial Achievable Potential Savings by End Use in 2025 (MMTh)

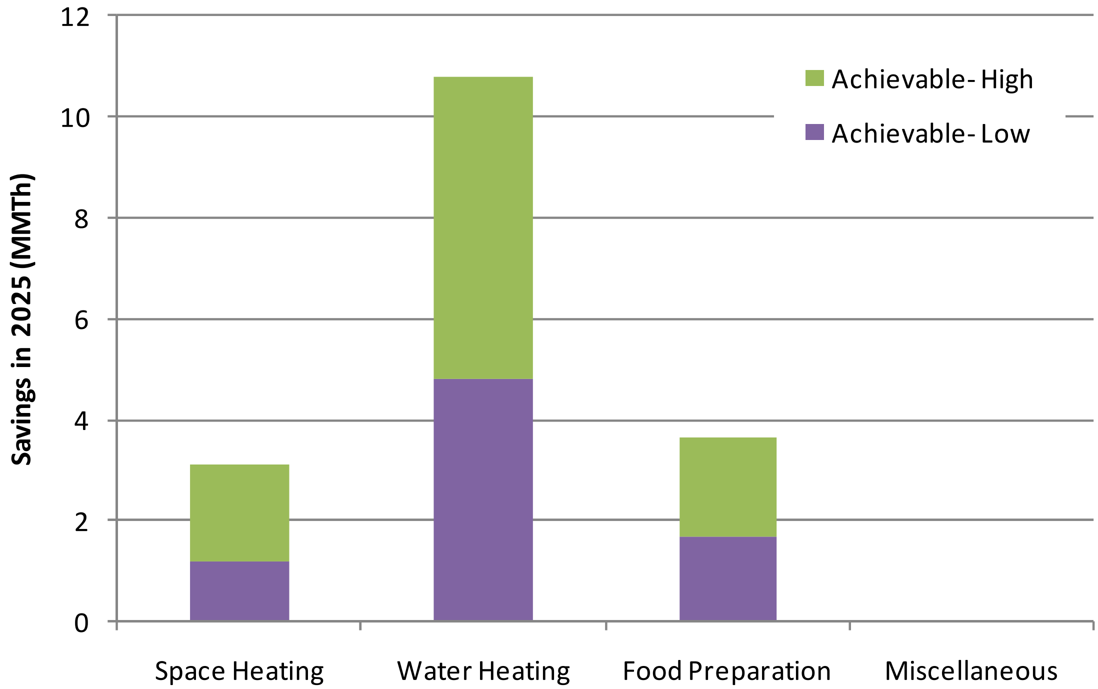


Table 6-14 and Table 6-15 present achievable potential savings for equipment measures and non-equipment measures, respectively under the Achievable - Low case. The greatest savings in 2025 come from:

- Replacement of water heaters with more efficient water heaters than the standard (4.67 MMTh)
- Replacement of food preparation equipment with more efficient fryers (0.58 MMTh) and more efficient steamers (0.46 MMTh)
- Replacement of furnaces with more efficient units (0.42 MMTh)

The replacement of water heaters accounts for more than 60% of the Achievable - Low potential savings in the commercial sector in 2025.

Table 6-14 Commercial Achievable - Low Savings for Equipment Measures (MMTh)

End Use	Technology	2012	2015	2020	2025
Space Heating	Boiler	0.02	0.07	0.15	0.28
	Furnace	0.01	0.03	0.22	0.42
Water Heating	Water Heater	0.18	0.90	2.45	4.67
Food Preparation	Fryer	0.03	0.15	0.37	0.58
	Griddle	0.01	0.03	0.08	0.13
	Oven	0.02	0.07	0.18	0.29
	Range	0.01	0.06	0.15	0.23
	Steamer	0.03	0.14	0.32	0.46
Miscellaneous	Pool Heater	0.00	0.00	0.00	0.00
Subtotal Equipment Measures		**0.31**	**1.44**	**3.93**	**7.07**
Total Equipment and Non-Equipment Measures		**0.3**	**1.5**	**4.1**	**7.7**

Table 6-15 Commercial Achievable - Low Savings for Non-equipment Measures (MMTh)

Measure	2012	2015	2020	2025
Energy Management System	0.001	0.005	0.038	0.139
Insulation - Wall Cavity (Good)	-	0.006	0.038	0.127
Water Heating - Faucet Aerators	0.000	0.003	0.040	0.093
Insulation - Wall Cavity (Better)	0.000	0.001	0.010	0.060
Thermostat - Clock/Programmable	0.000	0.003	0.027	0.045
Advanced New Construction Designs	0.000	0.000	0.006	0.035
Space Heating - Heat Recovery Ventilator	0.000	0.002	0.008	0.028
Insulation - Wall Cavity (Best)	0.000	0.001	0.006	0.021
Water Heating - Hot Water Saver	0.000	0.001	0.006	0.020
Custom Measures	-	0.000	0.002	0.008
Insulation - Ceiling (Good)	0.000	0.000	0.002	0.008
Water Heating - Tank Blanket	0.000	0.000	0.002	0.004
Water Heating - Drainwater Heat Recovery	0.000	0.000	0.000	0.002
Insulation - Ceiling (Better)	0.000	0.000	0.001	0.002
Insulation - Ceiling (Best)	0.000	0.000	0.000	0.001
Comprehensive Retrocommissioning	-	-	-	0.001
Water Heating - Pipe Insulation	-	-	0.000	0.001
Subtotal Non-Equipment Measures	**0.004**	**0.022**	**0.186**	**0.593**
Total Achievable- Low	**0.3**	**1.5**	**4.1**	**7.7**

6.3.3 Commercial Potential by Entity

Table 6-16 presents the commercial sector potential for each entity in the state. These estimates were developed by taking the total end-use estimates for the state and allocating them to each entity according to its share of total commercial natural gas use. Then, these estimates were adjusted to reflect weather differences between the entity's area and the state as a whole.

Please note that the allocation assumes that the mix of commercial sector activity in each entity's area is consistent with the mix for the state as a whole. While this is a reasonable assumption, each entity should take care in applying these estimates. For example, if the entity has no colleges, then the savings attributed to this sector at the state level should be removed or reallocated among the remaining sectors[10].

[10] The analysis tools and databases used to develop the state-level estimates are available to the individual entities should any wish to perform customized analysis.

Table 6-16 Commercial Efficiency Potential by Entity (MMTh)

Utility	Type	2012	2015	2020	2025
IOUs					
New Mexico Gas Company	Achievable - Low	0.261	1.212	3.411	6.353
	Achievable - High	0.794	3.394	8.446	14.591
	Economic	1.818	7.401	16.748	26.682
Non IOU					
City of Las Vegas Nat Gas Dept	Achievable - Low	0.006	0.028	0.080	0.150
	Achievable - High	0.018	0.078	0.198	0.347
	Economic	0.042	0.170	0.390	0.628
City of Los Alamos	Achievable - Low	0.003	0.015	0.043	0.079
	Achievable - High	0.010	0.042	0.105	0.182
	Economic	0.023	0.092	0.209	0.333
City of Socorro	Achievable - Low	0.002	0.010	0.028	0.052
	Achievable - High	0.007	0.028	0.069	0.120
	Economic	0.015	0.061	0.137	0.219
Deming Gas System	Achievable - Low	0.004	0.020	0.056	0.104
	Achievable - High	0.013	0.057	0.139	0.237
	Economic	0.030	0.124	0.277	0.437
Eastern New Mexico Natural Gas	Achievable - Low	0.000	0.002	0.006	0.011
	Achievable - High	0.001	0.006	0.014	0.025
	Economic	0.003	0.013	0.028	0.045
EMW Gas Association	Achievable - Low	0.002	0.009	0.026	0.050
	Achievable - High	0.006	0.026	0.065	0.115
	Economic	0.014	0.056	0.129	0.208
Las Cruces Municipal Gas	Achievable - Low	0.012	0.055	0.152	0.281
	Achievable - High	0.036	0.153	0.376	0.641
	Economic	0.082	0.334	0.748	1.181
Navajo Tribal Utility Authority	Achievable - Low	0.004	0.018	0.051	0.094
	Achievable - High	0.012	0.050	0.125	0.216
	Economic	0.027	0.110	0.248	0.396
Raton Natural Gas	Achievable - Low	0.002	0.009	0.025	0.048
	Achievable - High	0.006	0.025	0.063	0.111
	Economic	0.013	0.054	0.124	0.200
Rio Grande Natural Gas	Achievable - Low	0.007	0.031	0.086	0.158
	Achievable - High	0.020	0.086	0.212	0.361
	Economic	0.046	0.188	0.422	0.666
Town of Mountainair	Achievable - Low	0.000	0.000	0.000	0.001
	Achievable - High	0.000	0.000	0.001	0.002
	Economic	0.000	0.001	0.002	0.003

Utility	Type	2012	2015	2020	2025
Village of Corona	Achievable - Low	0.000	0.000	0.001	0.002
	Achievable - High	0.000	0.001	0.002	0.004
	Economic	0.000	0.002	0.005	0.007
Village of Hatch	Achievable - Low	0.001	0.003	0.009	0.017
	Achievable - High	0.002	0.009	0.023	0.039
	Economic	0.005	0.020	0.046	0.072
Zia Natural Gas	Achievable - Low	0.011	0.051	0.142	0.262
	Achievable - High	0.033	0.143	0.350	0.597
	Economic	0.076	0.311	0.698	1.101
Total	**Achievable - Low**	**0.32**	**1.46**	**4.12**	**7.66**
	Achievable - High	**0.96**	**4.10**	**10.19**	**17.59**
	Economic	**2.20**	**8.94**	**20.21**	**32.18**

6.4 INDUSTRIAL SECTOR POTENTIAL

The industrial sector makes up about one-quarter of New Mexico's total natural gas usage. Within the industrial sector, oil and gas extraction accounts for about 63% of the total natural gas use in 2009. Because of the size of this industry, we analyzed the oil and gas segment separately from the rest of the industrial use.

Most of the equipment replacement opportunities are in the process end use. Due to the site-specific nature of many industrial sector process energy efficiency opportunities, potential resulting from these customized approaches needs to be characterized individually. To further understand these site-specific opportunities, it would be appropriate to carry out site-specific engineering assessments for each customer and we would recommend that these assessments be limited to only the very largest customers.

In 2012, Achievable - Low potential is zero, but increases to 0.58 MMTh, or 0.2% of the baseline forecast in 2025. Table 6-17 presents the savings for the various types of potential considered in this study. Figure 6-11 illustrates the levels of industrial energy efficiency potential. Figure 6-12 presents the forecasts for each type of potential in the context of the baseline forecast.

Table 6-17 Energy Efficiency Potential for the Industrial Sector

Forecasts (MMTh)	2012	2015	2020	2025
Baseline Forecast	200	217	231	243
Savings (MMTh)				
Achievable - Low	0.0	0.0	0.2	0.6
Achievable - High	0.0	0.1	0.4	1.4
Economic	0.1	0.1	0.6	1.9
Technical	0.1	0.3	1.2	4.0
Savings (% of Baseline)				
Achievable - Low	0.0%	0.0%	0.1%	0.2%
Achievable - High	0.0%	0.0%	0.2%	0.6%
Economic	0.0%	0.1%	0.3%	0.8%
Technical	0.1%	0.1%	0.5%	1.7%

Figure 6-11 Industrial Energy Efficiency Potential Savings

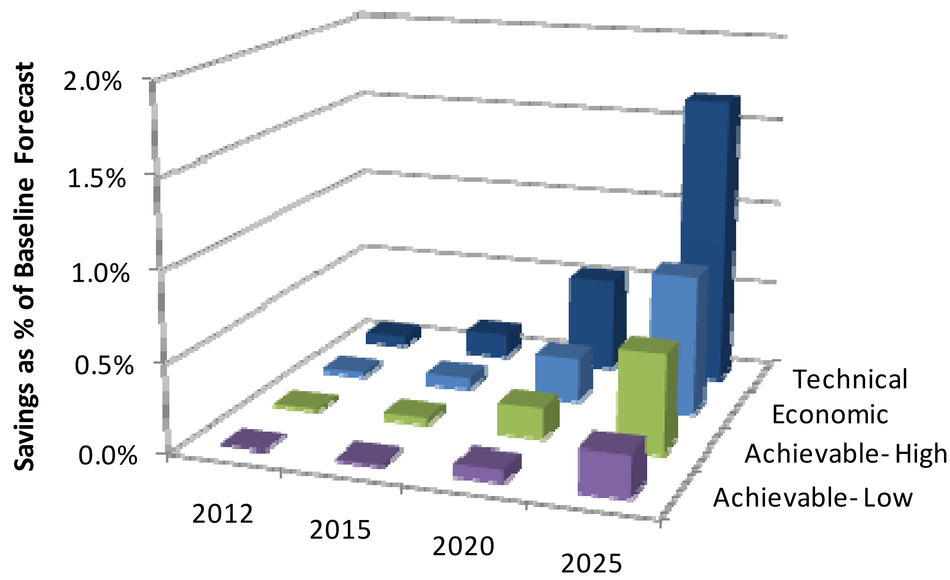
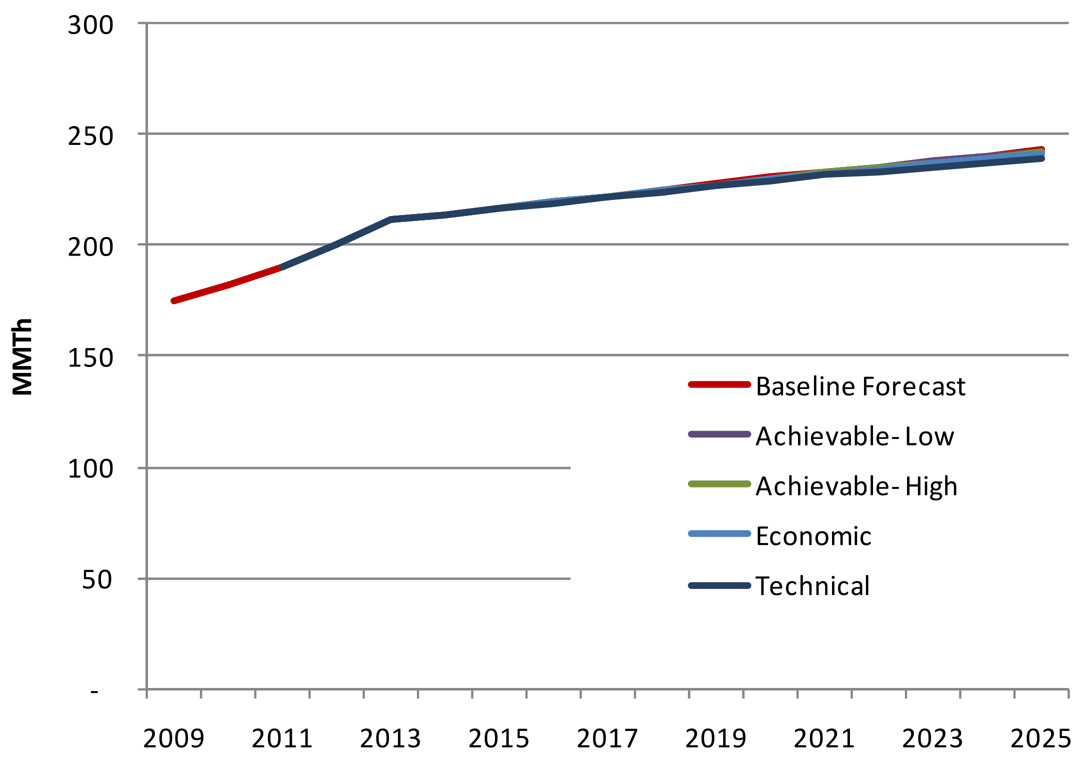


Figure 6-12 Industrial Energy Efficiency Potential Forecast



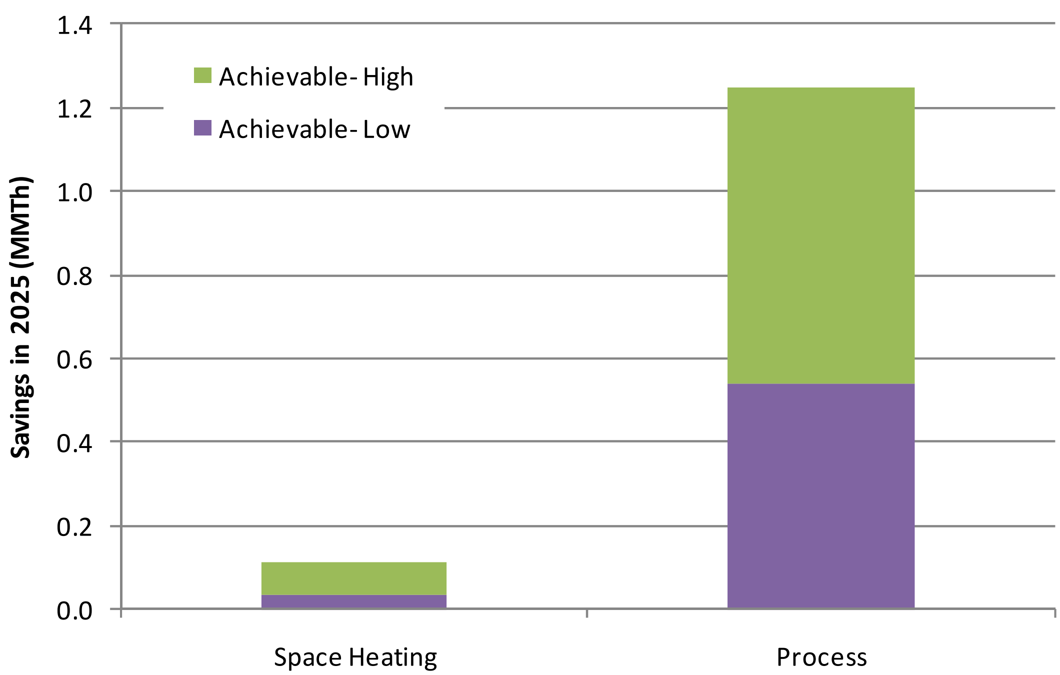
6.4.1 Industrial Potential by End Use

Table 6-18 presents the industrial savings by end use and type of potential. As mentioned above, process applications offer the greatest opportunity for energy savings across the range of potential. Figure 6-13 illustrates the achievable potential savings by end use, reinforcing the dominance of the process category.

Table 6-18 Industrial Potential by End Use and Potential Type (MMTh)

End Use	Type	2012	2015	2020	2025
Space Heating	Achievable - Low	0.00	0.00	0.01	0.04
	Achievable - High	0.00	0.01	0.04	0.11
	Economic Potential	0.00	0.01	0.05	0.14
	Technical Potential	0.02	0.05	0.20	0.64
Process	Achievable - Low	0.01	0.02	0.15	0.54
	Achievable - High	0.03	0.08	0.37	1.25
	Economic Potential	0.06	0.14	0.55	1.79
	Technical Potential	0.11	0.26	1.04	3.40
Total	**Achievable - Low**	**0.0**	**0.0**	**0.2**	**0.6**
	Achievable - High	**0.0**	**0.1**	**0.4**	**1.4**
	Economic Potential	**0.1**	**0.1**	**0.6**	**1.9**
	Technical Potential	**0.1**	**0.3**	**1.2**	**4.0**

Figure 6-13 Industrial Achievable Potential Savings by End Use, Selected Years (MMTh)



6.4.2 Industrial Potential by Entity

Table 6-19 presents the industrial sector potential for each entity in the state. These estimates were developed by taking the total end-use estimates for the state and allocating them to each entity according to its share of total industrial natural gas use. Then, these estimates were adjusted to reflect weather differences between the entity's area and the state as a whole.

Table 6-19 Efficiency Potential by Entity (MMTh)

Utility	Type	2012	2015	2020	2025
IOUs					
New Mexico Gas Company	Achievable - Low	0.006	0.022	0.139	0.489
	Achievable - High	0.027	0.075	0.345	1.152
	Economic	0.051	0.127	0.504	1.639
Non IOU					
DCP Midstream	Achievable - Low	0.000	0.001	0.009	0.032
	Achievable - High	0.002	0.005	0.023	0.076
	Economic	0.003	0.008	0.033	0.108
Eastern New Mexico Natural Gas	Achievable - Low	0.000	0.000	0.000	0.000
	Achievable - High	0.000	0.000	0.000	0.000
	Economic	0.000	0.000	0.000	0.000
El Paso Natural Gas	Achievable - Low	0.000	0.001	0.004	0.014
	Achievable - High	0.001	0.002	0.010	0.033
	Economic	0.001	0.004	0.015	0.047
EMW Gas Association	Achievable - Low	0.000	0.000	0.000	0.000
	Achievable - High	0.000	0.000	0.000	0.000
	Economic	0.000	0.000	0.000	0.001
Las Cruces Municipal Gas	Achievable - Low	0.000	0.001	0.006	0.020
	Achievable - High	0.001	0.003	0.014	0.047
	Economic	0.002	0.005	0.021	0.067
Natural Gas Pipeline Company of America	Achievable - Low	0.000	0.000	0.002	0.008
	Achievable - High	0.000	0.001	0.006	0.019
	Economic	0.001	0.002	0.009	0.028
Navajo Tribal Utility Authority	Achievable - Low	0.000	0.001	0.003	0.012
	Achievable - High	0.001	0.002	0.008	0.027
	Economic	0.001	0.003	0.012	0.039
Rio Grande Natural Gas	Achievable - Low	0.000	0.000	0.001	0.002
	Achievable - High	0.000	0.000	0.001	0.004
	Economic	0.000	0.000	0.002	0.006
Village of Hatch	Achievable - Low	0.000	0.000	0.000	0.001
	Achievable - High	0.000	0.000	0.001	0.002
	Economic	0.000	0.000	0.001	0.003
Total	**Achievable - Low**	**0.01**	**0.03**	**0.16**	**0.58**
	Achievable - High	**0.03**	**0.09**	**0.41**	**1.36**
	Economic	**0.06**	**0.15**	**0.60**	**1.94**

6.5 COSTS

In addition to developing estimates of savings, costs are also developed. Table 6-20 presents the total incremental costs of the measures, program administration costs (15% of incremental measure cost) and total program costs, assuming incentives that are equal to 50% of the incremental equipment cost.

Figure 6-14 illustrates the annual program costs assuming incentives levels equal to 50% of incremental costs:

- In the Achievable – Low case, the annual program costs range from $1 million to $13 million per year, with an average of $5.6 million per year over the forecast horizon.
- In the Achievable – High case, the annual program costs range from $4 million to $37 million per year, with an average of $16 million per year over the forecast period.

Figure 6-14 Annual Program Costs

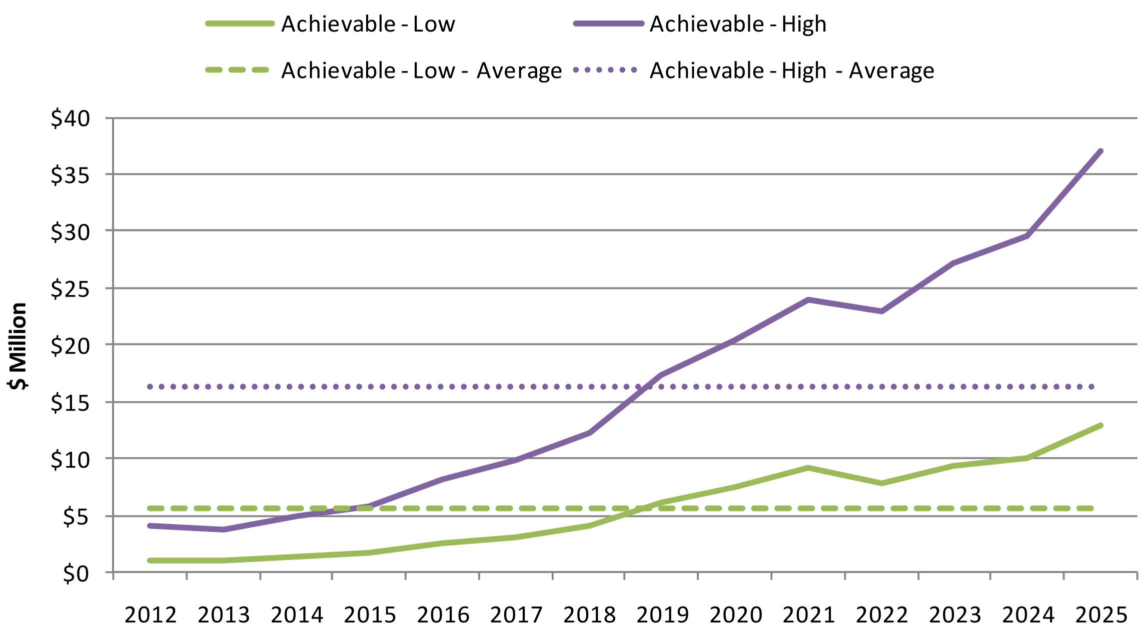


Table 6-20 Summary of Costs for Achievable Potential

	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	Average	Total in 2025
Annual Savings (GWh)																
Achievable - Low	0.5	0.5	0.6	0.7	0.9	1.1	1.4	1.9	2.4	2.9	2.5	2.8	2.9	3.6	1.8	25
Achievable - High	1.8	1.7	2.0	2.3	2.8	3.5	4.4	5.6	6.6	7.6	7.3	8.0	8.2	9.8	5.1	72
Incremental Measure Cost (Million $)																
Achievable - Low	$1.6	$1.7	$2.2	$2.6	$3.9	$4.9	$6.3	$9.4	$11.5	$14.1	$12.1	$14.4	$15.4	$20.0	$8.6	$119.9
Achievable - High	$6.3	$5.9	$7.5	$8.8	$12.6	$15.1	$19.0	$26.6	$31.5	$36.9	$35.3	$41.9	$45.4	$57.1	$25.0	$349.9
Program Administration Costs (Million $)																
Achievable - Low	$0.2	$0.2	$0.3	$0.4	$0.6	$0.7	$0.9	$1.4	$1.7	$2.1	$1.8	$2.2	$2.3	$3.0	$1.3	$18.0
Achievable - High	$0.9	$0.9	$1.1	$1.3	$1.9	$2.3	$2.8	$4.0	$4.7	$5.5	$5.3	$6.3	$6.8	$8.6	$3.7	$52.5
Total Program Cost with Incentives at 50%																
Achievable - Low	$1.0	$1.1	$1.4	$1.7	$2.5	$3.2	$4.1	$6.1	$7.5	$9.1	$7.9	$9.4	$10.0	$13.0	$5.6	$77.9
Achievable - High	$4.1	$3.8	$4.9	$5.8	$8.2	$9.8	$12.3	$17.3	$20.5	$24.0	$22.9	$27.3	$29.5	$37.1	$16.2	$227.4

6.6 SCENARIO ANALYSIS

In addition to the Reference forecast, two scenarios reflecting lower and higher avoided cost forecasts were developed. The Low case uses avoided costs that are 75% of those used for the Reference forecast and the High case uses avoided costs that are 150% of the Reference forecast case. The changes in avoided costs affect economic potential directly and the changes flow through to achievable potential.

- As avoided costs increase, the value of savings from energy-efficiency increases, causing the benefit-cost ratio to increase. If higher avoided costs result in measure B/C ratios increasing to a value of 1.0 or above, then the measures are included in economic potential.
- Conversely, lower avoided costs decrease the benefits from energy efficiency savings, thus lowering the B/C ratio. Measures that passed the economic screen in the reference case (100% of avoided costs), may no longer pass.

Focusing on economic potential in 2025, the scenario analysis results in the following:

- In the Low case, economic potential is about 10 MMTh lower than the Reference case, which is a 10% reduction in absolute savings. As a percentage of the Reference baseline forecast, the Low case saves 10.7% in 2025, compared to 11.8% in the Reference case.
- In the High case, economic potential is over 20 MMTh higher than in the Reference case, which is a 21% increase in absolute savings. As a percentage of the Reference baseline forecast, the High case saves 14.3% in 2025, compared to 11.8% in the Reference case.

The changes in savings flow through to achievable potential as shown in Table 6-21, Table 6-22, and Figure 6-15.

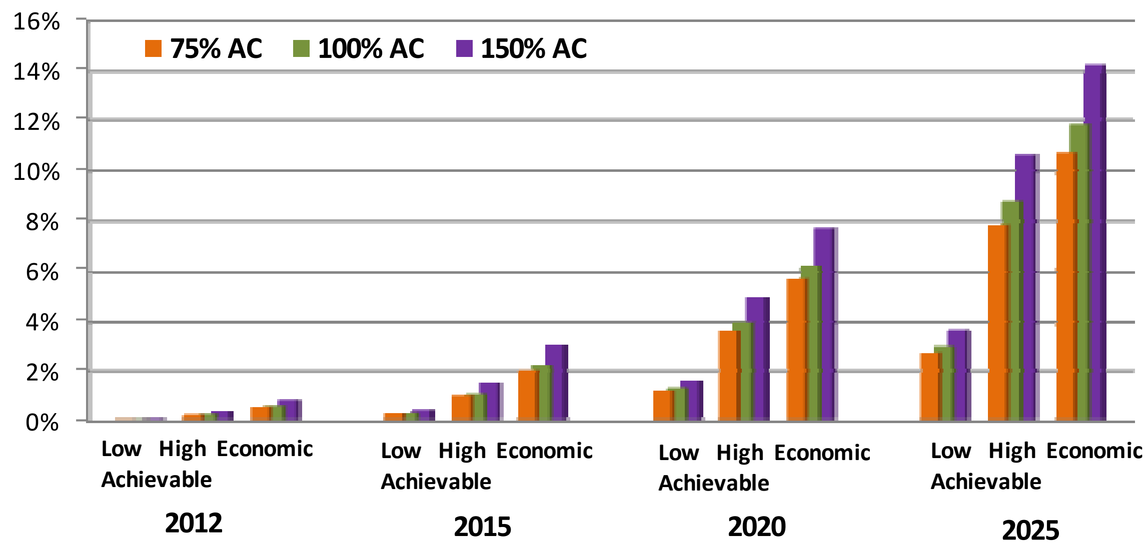
Table 6-21 Scenario Analysis Results – Energy Savings (MMTh)

Year	Type of Potential	Low 75% of Reference Avoided Costs	Reference	High 150% of Reference Avoided Costs
2012	Achievable - Low	0.49	0.51	0.69
	Achievable - High	1.84	1.91	2.75
	Economic	4.09	4.30	6.19
2015	Achievable - Low	2.29	2.42	3.34
	Achievable - High	7.84	8.35	12.02
	Economic	15.97	17.01	24.31
2020	Achievable - Low	10.12	11.06	13.63
	Achievable - High	31.13	34.00	42.19
	Economic	48.65	52.67	65.86
2025	Achievable - Low	24.57	27.72	33.76
	Achievable - High	71.98	80.52	97.35
	Economic	98.02	108.49	130.89

Table 6-22 Scenario Analysis Results – Energy Savings as a Percentage of the Baseline Forecast

Year	Type of Potential	Low 75% of Reference Avoided Costs	Reference	High 150% of Reference Avoided Costs
2012	Achievable - Low	0.07%	0.07%	0.09%
	Achievable - High	0.25%	0.26%	0.37%
	Economic	0.55%	0.58%	0.83%
2015	Achievable - Low	0.29%	0.31%	0.42%
	Achievable - High	1.00%	1.06%	1.53%
	Economic	2.03%	2.16%	3.09%
2020	Achievable - Low	1.19%	1.30%	1.60%
	Achievable - High	3.65%	3.99%	4.95%
	Economic	5.71%	6.18%	7.73%
2025	Achievable - Low	2.68%	3.02%	3.68%
	Achievable - High	7.85%	8.78%	10.61%
	Economic	10.68%	11.83%	14.27%

Figure 6-15 Scenario Analysis Results – Energy Savings as a Percentage of the Baseline Forecast



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