South Dakota Energy Efficiency Plan
Model Description

General Description

MidAmerican's energy efficiency planning model is an Excel spreadsheet-based model that calculates the costs and benefits of MidAmerican's proposed energy efficiency program. The model evaluates the costs and benefits of individual measures to be included in various programs based on expected savings, investment costs, useful life data, and expected program participation. The model calculates spending budgets for each program and estimates the net economic benefits of each program to South Dakota customers. The main inputs to this model are:

- Avoided electric and gas costs
- Measure load shapes
- Incremental customer energy rates
- Discount rates
- Measure specific data
    - Savings
    - Incremental cost
    - Useful life
    - Incentive
    - Non-energy benefits

Discussion of Avoided Costs

The following is a general description of the methodologies used by MidAmerican Energy Company to determine avoided electric and gas capacity and energy costs for use in the 2013-2017 South Dakota Energy Efficiency Plan.

Generation Capacity Cost

Avoided generation capacity costs are calculated by determining the economic carrying charge associated with a new combined cycle generation unit sited in Iowa rated at approximately 180 MW during summer peaking conditions.

Economic carrying charge assumptions include:

- 40 year book life
- 15 year tax life
- 2.25% escalation for O&M expense
- 50/50 capital structure at 11.50% ROE and 5.75% LTD
- 7.43% discount rate

Transmission Capacity Cost

Avoided transmission capacity costs are calculated by determining the economic carrying charge associated with MidAmerican's net transmission investment on a $/kW basis, where kW refers to the total transmission system capacity. The calculation of net investment is as follows:

- Total transmission plant (FERC p. 207, line 58)
- Less total accumulated depreciation (FERC p. 219, line 25)
- Net transmission plant

Economic carrying charge assumptions include:

- 43 year book life
- 15 year tax life
- O&M expense equal to 12.62% of transmission net investment per kW
- 2.25% escalation for O&M expense
- 1.54% property tax rate
- 50/50 capital structure at 11.50% ROE and 5.75% LTD
- 12% capacity reserve margin
- 7.43% discount rate

Distribution Capacity Cost

Avoided distribution costs are calculated by determining the economic carrying charge associated with MidAmerican's net distribution investment on a $/kW basis, where kW refers to the total distribution system capacity. The calculation of net investment is as follows:

- Total distribution plant (FERC p. 207, line 75)
- Less services (p. 207, line 69)
- Less meters (p. 207, line 70)
- Less street lighting and signals (p. 207, line 73)
- Original cost distribution plant

- Total accumulated depreciation for distribution plant (FERC p. 219, line 26)
- Less services (internal)
- Less meters (internal)
- Less street lighting and signals (internal)
- Accumulated depreciation for distribution plant

- Original cost distribution plant
- Less total accumulated depreciation for distribution plant
- Net distribution plant

Economic carrying charge assumptions include:

- 35 year book life
- 20 year tax life
- O&M expense equal to 8.33% of transmission net investment per kW
- 2.25% escalation for O&M expense
- 0.10% property tax rate
- 50/50 capital structure at 11.50% ROE and 5.75% LTD
- 7.43% discount rate

Avoided Energy Cost – Electric

The electric avoided energy costs are calculated on an hour by hour basis for 34 forecast years. These avoided costs are calculated through MidAmerican's generation system dispatch models and represent the expected variable cost of adding one MW of retail load (or conversely the avoided cost of removing one MW of retail load) in each hour of the year for 34 years. The avoided energy cost represents the operating cost of the marginal unit needed to serve retail load in any hour, which will generally have a higher variable operating cost than the average variable cost of all units in that hour. The avoided energy cost calculation takes into account the stacking order of units on the system, forced and unforced outage rates of various units, and the spot market price of energy during hours when purchasing energy in the market to serve retail load is a cheaper option than serving retail load from MidAmerican's generating units.

Gas Capacity Costs

Avoided gas capacity costs are calculated by summing the following values:

- Total value of reservation cost for DSS and FDD service for peak months divided by the sum of all monthly maximum daily withdrawal quantities in the peak period (November – March), plus
- Total value of reservation cost for DSS and FDD service for off-peak months divided by the sum of all monthly maximum daily withdrawal quantities in the off-peak period (April - October), plus
- Five percent reserves.

Avoided Energy Cost – Gas

The natural gas avoided energy costs are calculated on a monthly basis and represents MidAmerican's long-term forecast of the weighted average of commodity costs plus delivery costs to MidAmerican's primary gas receipt points for 2014-2021. Beyond 2021, natural gas forecasts are escalated at 2.25% from 2021 forecasted values.

Load Shapes

Load shapes are used in the model to convert annual kWh or therm savings for a specific measure to hourly and/or daily savings so that savings can be applied against hourly avoided electric costs and daily avoided gas costs to determine the total annual avoided electric and gas cost for each measure. Generic load shapes that are assigned to individual measures are estimated using data from MidAmerican's 2011 class load research data base. Class load data is entered into a statistical model along with hourly temperature data and total system loads to develop standardized hourly load shapes and annual load factors for cooling loads, heating loads, combined cooling and heating loads, and non-weather sensitive base loads for residential gas heat and electric heat customers, small commercial gas heat and electric heat customers, large commercial gas heat and electric customers, and industrial customers. In addition, a specialty load shape is developed for the residential direct load control program. Each of these individual load shapes are then assigned to individual measures in the model for the purposes of estimating annual avoided electric and gas costs.

Rates

Customer rates are used in the model to estimate bill savings to customers associated with implementing energy efficiency measures. Rates used in the model are monthly incremental rates that represent the cents/kWh or cents/therm that can be avoided by reducing a kWh or therm of energy use (as opposed to average rates). Incremental electric rates are calculated for residential gas heat customers, residential electric heat customers, commercial customers, and industrial customers. Incremental gas rates are calculated separately for residential and commercial customers. Incremental rates are calculated based on an analysis of monthly usage and revenues for each of these classes and are escalated at 3.40% per year for electric rates and 2.25% per year for gas distribution rates.

Discount Rates

Discount rates are used in the model to develop estimates of the net present value of savings realized from measures of the multi-year life of each measure, and program costs incurred over the five years of the proposed program. There are three different discount rates used in this model.

Participant Discount Rate – The discount rate used to estimate the net present value of bill savings, non-energy benefits, rebates, and investment made by participants in the program is assumed to be 14.91%. This is based on the national average credit card rate as of May 14, 2012 according to CreditCards.com. A discount rate associated with a typical consumer credit card rate is used to represent the customer's presumed cost of money for a typical energy efficiency investment.

Weighted Average Cost of Capital – The discount rate used to estimate the net present value of costs and benefits for the utility test, ratepayer impact test, and total resource cost (TRC) test is the utility's weighted average cost of capital (WACC) as calculated for use in the 2014-2023 Iowa Statewide Assessment of Energy Efficiency Potential. The WACC rate was calculated in the fall of 2011 and represents the utility's cost of capital. The WACC discount rate used in the model is 7.43%.

Societal Discount Rate – The discount rate used to estimate the net present value of costs and benefits for the Societal Test is a societal discount rate prescribed by Iowa Utility Board rules for determining the cost-effectiveness of energy efficiency programs. This discount rate is defined to be the daily average of 10-year and 30-year U.S. Treasure Bond yields over a 365 day period. This rate was calculated for use in the 2014-2023 Iowa Statewide Assessment of Energy Efficiency Potential and was calculated in the fall of 2011 and represents the utility's cost of capital. The Societal Discount Rate used in the model is 3.56%.

<u>Measure Specific Data</u>

Most of the measure-specific data used in the model is taken from the 2014-2023 Iowa Statewide Assessment of Energy Efficiency and adjusted for climate conditions in Sioux City, IA and Sioux Falls, SD for weather-sensitive measures where appropriate. Information on energy savings, incremental costs, useful lives, incentives, and non-energy benefits are provided on a measure by measure basis in the measure fact sheets included in Appendix A of the Plan document.