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Black Hills Energy

Natural Gas Energy Efficiency Programs

Annual Report 2015

Prepared for
Iowa Utilities Board
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Prepared by
Black Hills Energy

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Executive Summary

Black Hills Energy is pleased to present this 2015 annual report on its gas energy efficiency plan, pursuant to Docket No. EEP-2013-0001 of the Iowa Utility Board.

Program Portfolio Overview

Black Hills Energy's energy efficiency portfolio of programs targets four sectors:

- Residential
- Nonresidential
- Low income
- Public purpose

Black Hills Energy designed its programs to address the particular needs of each sector's various customer types.

The residential programs contain the following elements:

- Evaluations
- Prescriptive rebates
- New construction

The nonresidential programs contain the following elements:

- Commercial evaluations
- Prescriptive and custom rebates
- New construction

The low-income programs contain the following elements:

- Low-income weatherization and weatherization teams
- Energy education
- Multifamily improvements
- Affordable housing
- Green Iowa AmeriCorps (GIAC)

The public purpose programs contain the following elements:

- School-based energy education
- Tree programs (e.g., Trees Forever, Trees for Kids/Teens Programs)
- Other public purpose programs (e.g., funding for the Iowa Energy Center [IEC] and the Center for Global and Regional Environmental Research [CGRER])

Program Budgets, Savings, and Cost-Effectiveness

Table ES-1 presents projected 2015 budgets and actual expenditures for the program sectors and categories; these include general expenditures, cross-program training, marketing, and administration.

Table ES-1. 2015 Utility Budget by Sector*

Sector/Category	2015 Projected Budget	2015 Actual	Percentage of Projected Budget
Residential	$3,683,800	$3,663,869	99%
Nonresidential	$1,199,400	$1,005,993	84%
Low Income	$694,000	$771,531	111%
Public Purpose	$459,000	$457,636	100%
Cross-Program Expenditures	$369,000	$335,015	91%
Other Funding Initiatives**	$25,000	$18,957	76%
Total	$6,430,200	$6,253,002	97%

* May not sum to total due to rounding.
** Other Funding Initiatives include the technical reference manual, the joint utility study, and preparation of the next energy efficiency plan.

Table ES-2 provides the projected 2015 budget and actual expenditures by program.

Table ES-2. Program 2015 Budget Summaries*

Program Category	2015 Projected Budget	2015 Actual Expenditures	Percentage of Projected Achieved
Residential Programs			
R.1 – Residential Evaluation	$697,000	$602,657	86%
R.2 – Residential Prescriptive	$2,480,100	$2,920,533	118%
R.3 – Residential New Construction	$506,800	$140,679	28%
Nonresidential Programs			
NR.1 – Nonresidential Evaluation	$101,500	$152,246	150%
NR.2 – Nonresidential Prescriptive	$826,000	$549,092	66%
NR.3 – Nonresidential Custom	$54,800	$95,262	174%
NR.4 – Nonresidential New Construction	$217,100	$209,392	96%
Low-Income Programs			
LI.1 – Weatherization Program	$614,400	$644,311	105%
LI.2 – Energy Education Program	$23,500	$69,405	295%
LI.3 – Multifamily Efficiency Improvement Initiative Program	$14,800	$44,169	298%
LI.4 – Affordable Homes Program	$3,600	$3,549	99%
LI.5 – Weatherization Team Program	$15,700	$10,097	64%
LI.6 – GIAC	$22,000	$0	0%
Public Purpose Programs			
PP.1 – School-Based Energy Education	$82,900	$124,493	150%
PP.2 – Tree Planting Programs	$145,000	$138,314	95%
PP.3 – IEC and CGRER	$231,100	$194,829	84%
Cross-Program Training, Marketing, and Administration			
	$369,000	$335,015	91%

Program Category	2015 Projected Budget	2015 Actual Expenditures	Percentage of Projected Achieved
Other Funding Initiatives**			
	$25,000	$18,957	76%
Total Budget			
	$6,430,200	$6,253,002	97%

* May not sum to total due to rounding.
** Other Funding Initiatives include the technical reference manual, joint utility study, and the next energy efficiency plan preparation.

Table ES-3 presents projected and actual savings for each sector.

Table ES-3. 2015 Savings (MCF) by Sector*

Sector	2015 Projected	2015 Actual	Percentage of Projected Achieved
Residential	72,017	72,816	101%
Nonresidential	31,778	34,911	110%
Low Income	4,262	4,893	115%
Public Purpose	3,940	6,427	163%
Total	111,996	119,047	106%

* May not sum to total due to rounding.

Table ES-4 provides 2015 projected and actual savings, by program.

Table ES-4. Projected and Actual Savings (MCF) by Program*

Program Category	2015 Projected MCF	2015 Actual MCF	Percent of Projected Achieved
Residential Programs			
R.1 – Residential Evaluation	5,510	1,310	24%
R.2 – Residential Prescriptive	56,787	71,494	126%
R.3 – Residential New Construction	9,720	13	0.1%
Nonresidential Programs			
NR.1 – Nonresidential Evaluation	336	45	13%
NR.2 – Nonresidential Prescriptive	14,719	26,555	180%
NR.3 – Nonresidential Custom	6,224	3,726	60%
NR.4 – Nonresidential New Construction	10,499	4,585	44%
Low-Income Programs			
LI.1 – Weatherization Program	1,695	1,639	97%
LI.2 – Energy Education Program	969	2,562	264%
LI.3 – Multifamily Efficiency Improvement Initiative Program	2	361	18,034%
LI.4 – Affordable Homes Program	37	-	0%
LI.5 – Weatherization Team Program	779	177	23%
LI.6 – GIAC	780	153	20%

Program Category	2015 Projected MCF	2015 Actual MCF	Percent of Projected Achieved
Public Purpose Programs			
PP.1 – School-Based Energy Education	3,728	3,780	101%
PP.2 – Tree Planting Programs	211	2,647	1255%
PP.3 – IEC & CGRER	N/A	NA	NA
Total Savings			
	111,996	119,047	106%

*May not sum due to rounding.

Table ES-5 provides 2015 projected and actual peak demand savings by program.

Table ES-5. Projected and Actual Peak Demand Savings (MCF/day) by Program*

Program Category	2015 Projected MCF	2015 Actual MCF	Percentage of Projected Achieved
Residential Programs			
R.1 – Residential Evaluation	60	3.5	6%
R.2 – Residential Prescriptive	597	769	115%
R.3 – Residential New Construction	106	0.1	0.1%
Nonresidential Programs			
NR.1 – Nonresidential Evaluation	3	0.2	7%
NR.2 – Nonresidential Prescriptive	149	277	209%
NR.3 – Nonresidential Custom	65	48	74%
NR.4 – Nonresidential New Construction	110	39	35%
Low-Income Programs			
LI.1 – Weatherization Program	19	18	94%
LI.2 – Energy Education Program	11	28	255%
LI.3 – Multifamily Efficiency Improvement Initiative Program	0.02	1	4,813%
LI.4 – Affordable Homes Program	0.4	-	0%
LI.5 – Weatherization Team Program	9	2	21%
LI.6 – GIAC	9	2	19%
Public Purpose Programs			
PP.1 – School-Based Energy Education	41	41	101%
PP.2 – Tree Planting Programs	2	29	1,446%
PP.3 – IEC & CGRER	N/A	-	N/A
Total	1,181	1,257	106%

*May not sum due to rounding.

Table ES- 6 provides 2015 overall portfolio cost-effectiveness data.

Table ES- 6. Portfolio Cost-Effectiveness

Cost-Effectiveness Test	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
Societal Cost (SCT)	$11,544,557	$14,236,336	$2,691,780	1.23
Utility Cost Test (UCT)	$6,253,002	$8,797,851	$2,544,849	1.41
Ratepayer Impact Test (RIM)	$15,164,259	$8,797,851	($6,366,408)	0.58
Participant Cost (PCT)	$8,889,759	$12,883,556	$3,993,797	1.45

Report Contents

In addition to the Executive Summary, this report includes the following chapters and appendices:

- Chapters 1, 2, 3, and 4 detail the overall energy efficiency protocols for the residential, nonresidential, low-income, and public purpose programs, respectively. The chapters contain general discussions of topics relevant to the programs as well as detailed descriptions of individual programs (e.g., budgets, participation, measures, impacts, and, where required, cost-effectiveness results).
- The following appendices complete the document, providing data necessary for successfully filing the report:
  - Appendix A: Confidential Cost-Effectiveness Assumptions
  - Appendix B: Confidential Detailed Cost-Effectiveness Workbooks (in Microsoft Excel format)

1. Residential Programs

Introduction

This chapter describes Black Hills Energy's portfolio of residential energy efficiency programs. It begins with examining the overall cost-effectiveness for the sector portfolio and includes a detailed description of each program. Table 1 lists Black Hills Energy's portfolio of residential programs.

Table 1. Black Hills Energy Residential Programs

Program
R.1 – Residential Evaluation
R.2 – Residential Prescriptive
R.3 – Residential New Construction

Residential Sector Cost-Effectiveness

Table 2 shows the three residential programs' cost-effectiveness, combined into a single portfolio.

Table 2. Residential Programs' Cost-Effectiveness Results

Cost-Effectiveness Test	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
Societal Cost Test (SCT)	$8,210,902	$8,760,974	$550,072	1.07
Utility Cost Test (UCT)	$3,663,869	$5,404,996	$1,741,127	1.48
Ratepayer Impact Test (RIM)	$9,152,173	$5,404,996	($3,747,176)	0.59
Participant Cost Test (PCT)	$7,366,511	$8,034,060	$667,549	1.09

R.1 – Residential Evaluation Program

Program Description

The Residential Evaluation Program offers four types of evaluations to single-family households: (1) a free online evaluation; (2) a free walk-through evaluation; (3) a Tier I comprehensive evaluation; and (4) a Tier II comprehensive evaluation. Black Hills Energy offers these four components to provide customers with multiple entry points to the program. In addition to the single-family components, the program offers an on-site evaluation for multifamily homes. Both the single-family and multifamily evaluators provide recommendations to customers about ways they can reduce their energy consumption, while maintaining or improving their homes' comfort. Customers receiving recommendations during their on-site evaluations for shell measure improvements become eligible to obtain incentives through Black Hills Energy's Residential Prescriptive Program. In addition, customers participating in the Residential Evaluation Program learn of a 10% bonus incentive available for those installing three or more measures during the program year.

Program Summary

Table 3 compares the program budget and goals to actual 2015 program performance.

Table 3. Residential Evaluation Program Summary*

Measured Target	Projected	Actual	Percentage of Projected Achieved
Participation	2,648	1,200	45%
Expenditures	$697,000	$602,657	86%
Energy Target (MCF)	5,510	1,310	24%
Demand Impacts (MCF/day)	60	4	6%

*The table does not include participation projections for the online evaluation.

Table 4 summarizes participation by evaluation type.

Table 4. Residential Evaluation Tier Participation Summary

Program	Projected Participation	Actual Participation	Percentage of Projected Achieved
Single Family Evaluations			
Walkthrough/Online Evaluation	2,500	1,168	47%
Tier 1	75	32	43%
Tier 2	5	0	0%
Multifamily Evaluations			
	5	0	0%

Table 5 shows the number of installations for each measure type.

Table 5. Residential Evaluation Measure Installation Summary

Measure	Projected Installations	Actual Installations	Percentage of Projected
Faucet Aerator 0.5 GPM	1827	627	34%
Faucet Aerator 1.5 GPM	1245	353	28%
Hot Water Pipe Insulation for Water Heater (R-4)	503	219	44%
Low Flow Shower Head 2.0 GPM	1774	583	33%
Infiltration kits	503	0	0%

Table 6 summarizes savings by evaluation type.

Table 6. Residential Evaluation Tier Savings Summary

Program	Projected Savings	Actual Savings	Percentage of Projected Achieved
Single Family Evaluations			
Walkthrough/Online Evaluation	5200	1,293.8	15%
Tier 1	156	16.2	6%
Tier 2	10	-	0%
Multifamily Evaluations			
	142	0	0%

Table 7 summarizes savings for measure type.

Table 7. Residential Evaluation Measure Savings Summary

Measure	Projected Savings (MCF)	Actual Savings (MCF)	Percentage of Projected
Faucet Aerator 0.5 GPM	1403.8	483.8	34%
Faucet Aerator 1.5 GPM	580.5	163.4	28%
Hot Water Pipe Insulation for Water Heater (R-4)	158.6	67.7	43%
Low Flow Shower Head 2.0 GPM	1829.9	595.1	33%
Infiltration kits	1539.4	0	0%

A primary purpose of the Residential Evaluation Program is to identify savings opportunities and to inform customers of the incentives available through the Residential Prescriptive Program. Table 8 summarizes the number of Residential Prescriptive Program incentives received by participants in the Residential Evaluation Program. Overall, 38.7% of the participants in the Residential Evaluation Program implemented measures through the Residential Prescriptive Program.

Table 8. Residential Evaluation Conversion Rate and Residential Prescriptive Measures Installed by Residential Evaluation Participants

Res Prescriptive Measures	Installed	Percentage of Total
Ceiling Insulation - State Code Northern Iowa R-49	182	39.6%
Maintenance - Clean and Tune Furnace/Boiler	68	14.8%
Replacement Furnace	52	11.3%
Wall Insulation 2X4 R-13	31	6.7%
Insulation (basement wall) R-15	30	6.5%
Insulation (Rim and Band Joist) R-10	22	4.8%
Programmable thermostat (Professionally installed)	12	2.6%
Insulation (foundation wall) R15	11	2.4%
Wi-Fi Thermostat	9	2.0%
Storage Water Heater - Replacement before EOL- 67% EF	8	1.7%
Insulation (floor) R-30	7	1.5%
DHW Tankless On-Demand - Residential Grade	5	1.1%
Residential Clothes Washer Measure	4	0.9%
Combined Services Furnace/boiler maintenance and qualified setback thermostat (professional installation)	4	0.9%
Replacement Water Heater	3	0.7%
Replacement Boiler	3	0.7%
RBLR Measure	2	0.4%
Programmable thermostat (Self-installed)	2	0.4%
Natural Gas Fireplace - 70% AFUE	2	0.4%
Storage Water Heater - Condensing	1	0.2%
Caulking and Weather Stripping Installation with Blower Door Test	1	0.2%
Rebate Bundle	1	0.2%
Door (R-4.8 or U-0.20)	182	39.6%
Total	460	

Measures and Incentives

The Residential Evaluation Program offers participants the following energy efficiency measures at no cost:

- Faucet aerators
- Outlet gaskets
- Hot water pipe insulation
- Low-flow showerheads
- Low-cost infiltration measures

On average, a participating customer receives about $30 worth of measures during the evaluation.

Participation

The Residential Evaluation Program projected 2,648 participants in 2015 and achieved 1,200 participants.

Budget

Black Hills Energy covers the entire cost of all direct-install measures and walk-through evaluations.[1] Customers participating in the Tier I comprehensive evaluation must provide a $100 copay; Black Hills Energy covers the remaining cost (approximately $300). Customers opting for the Tier II comprehensive evaluation must provide a $200 copay; Black Hills Energy covers the remaining cost (approximately $500). Customers participating in the multifamily evaluation must provide an $800 copay; Black Hills Energy covers the remaining costs (approximately an additional $800 per site). The 2015 proposed program budget was $697,000. Actual expenditures equaled $602,657.

Savings

Projected program savings were 5,510 MCF for 2015. Actual savings equaled 1,310 MCF.

Cost-Effectiveness Results

Table 9 presents the cost-effectiveness analysis results, based on 2015 program activity.

Table 9. Residential Evaluation Program Cost-Effectiveness Results

Cost-Effectiveness Test	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
Societal Cost (SCT)	$595,908	$80,443	($515,464)	0.13
Utility Cost Test (UCT)	$602,657	$60,332	($542,325)	0.10
Ratepayer Impact (RIM)	$671,542	$60,332	($611,209)	0.09
Participant Cost (PCT)	$246,400	$319,987	$73,587	1.30

Highlights and Challenges

Low gas prices continue to be a challenge in garnering participation in this program. Homeowner approval for installations of measures also has proven to be a challenge because many homes already have or do not want the measure installed. However, despite low gas prices, there was a slight increase in participation in this program over 2014 numbers.

R.2 – Residential Prescriptive Program

Program Description

The Residential Prescriptive Program provides incentives to customers who improve the efficiency of their home through the following activities: (1) installing measures such as high-efficiency furnaces, boilers, water heaters, and setback thermostats; (2) early replacement of water heaters; (3) furnace maintenance; (4) innovative space- and water-heating technologies; (5) high-efficiency clothes washers; and (6) envelope measures, such as roof, wall, and foundation insulation and infiltration control.[2,3]

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1 The walk-through evaluation and corresponding leave-behind measures have a monetary value of approximately $200 per home.

2 Customers must have natural gas water heating to become eligible for the clothes washer incentive.

3 Customer must have natural gas heating as their primary heating source and must have received an on-site evaluation to become eligible for envelope measure incentives and the end-of-life water heater incentive.

Program Summary

Table 10 compares the program's budget and goals to actual 2015 program performance.

Table 10. Residential Prescriptive Program Summary

	Projected	Actual	Percentage of Projected Achieved
Participation	10,801	10,649	99%
Expenditures	$2,480,100	$2,920,533	118%
Energy Target (MCF)	56,787	71,494	126%
Demand Impacts (MCF/day)	597	689	115%

Measures and Rebates

Table 11 list eligible measures, their efficiency levels, and their rebate levels. Insulation measure rebate structures roughly cover two-thirds of the measure's incremental costs and encourage customers to adopt the highest-efficiency levels technically feasible.

Table 11. Residential Prescriptive Program Measure Summary

Measure Name	Measure Description	Proposed Incentive	Dealer Spiff
R.2 Residential Prescriptive			
Furnace	≥ 96% annual fuel utilization efficiency (AFUE)	$600	$150
Furnace	≥ 94% AFUE	$400	$150
Boiler ≤ 300 kBtuh	≥ 95% AFUE	$600	$150
Gas Fireplace	≥ 70% AFUE, intermittent ignition, heat rated, and thermostatic control with blower	$250	
Duct Repair/Sealing	≤ 8 CFM/100 square feet of conditioned space; Duct blaster test required	70% up to $200	
Integrated Space and Water Heater	Integrated space and water heater; ≥ 84% CAE or 95% boiler indirect-fired water heater	$375	$175
Multizone Thermostat	Individual room temperature control for major occupied rooms	$450	$60
Furnace/Boiler Maintenance	Furnace and/or boiler maintenance	Up to $50	
Setback Thermostat	Programmable thermostat; 5-1-1, 5-2, or 7-day (customer installation)	Up to $20	
Setback Thermostat	Programmable thermostat; 5-1-1, 5-2, or 7-day (professional installation)	Up to $50	
Wi-Fi Programmable Thermostat	Wi-Fi programmable thermostat	Up to $50	
Combined Service	Furnace/boiler maintenance and qualified setback thermostat (professional installation)	Up to $150	
Insulation (ceiling)	≥ R-49	70% up to $750	
Insulation (2x4 wall)	≥ R-13	70% up to $750	
Insulation (2x6 wall)	≥ R-20 or R-13 w/ R-5 sheathing	70% up to $750	
Insulation (basement/foundation wall)	≥ R-15	70% up to $750	
Insulation (floor)	R-30*	70% up to $750	
Insulation (rim and band joist)	≥ R-10	70% up to $750	
Infiltration Control	≤ 7.0 ACH 50 and blower door required	70% up to $200	

Measure Name	Measure Description	Proposed Incentive	Dealer Spiff
R.2 Residential Prescriptive			
Thermal Door	ENERGY STAR® door (R-4.8 or U-0.20)	$10	
Water Heater	≥ 0.67 & ENERGY STAR-qualified storage	$150	$10
Water Heater	≥ 0.80 EF or ≥ 90% TE and ≥ 40 gallon storage/condensing/tankless	$300	$60
Water Heater	Replacement before end-of-life (storage); ≥ 0.67 EF & ENERGY STAR qualified & ≤ 11 years old	$425	$10
Clothes Washer	(ENERGY STAR or qualified standard clothes washer) MEF ≥ 2.0 and WF ≤ 6.0	$50	
Residential Prescriptive Bundle			
Rebate Bundle	10% bonus incentive on top of rebate package if minimum of three residential prescriptive measures are installed within the program year	10% of total incentives received	

*IA code is R-30 or insulation to fill the cavity (R-19 minimum).

Table 12 summarizes the total number of installations per measure.

Table 12. Residential Prescriptive Program Installations by Measure

Measure Name	Measure Description	Projected Installations	Actual Installations	Percentage of Projected
Furnace	96% AFUE or greater	315	1,886	599%
Furnace	94% to 95.9% AFUE	1,500	871	58%
Boiler	95% AFUE or greater	79	84	106%
Gas Fireplace	70% AFUE or greater, intermittent ignition, heat rated, thermostatic control with blower	3	41	1,367%
Duct Sealing	8 CFM/100 square feet of CFA	26	0	0%
Integrated Space and Water Heater	Integrated space and water heater ≥ 84% CAE or 95% boiler indirect-fired water heater	26	6	23%
Multizone Thermostat	Individual room temperature control for major occupied rooms	3	7	233%
Furnace/Boiler Maintenance	Furnace and/or boiler maintenance	3,300	4,504	136%
Setback Thermostat	5-1-1, 5-2, or 7-day (customer installation)	105	43	41%
Setback Thermostat	5-1-1, 5-2, or 7-day (professional installation)	1,995	1,222	61%
Wi-Fi Programmable Thermostat	Wi-Fi programmable thermostat	26	332	1,277%
Furnace/Boiler Maintenance and Setback Thermostat	Furnace/Boiler maintenance and setback thermostat (professional installation)	158	122	77%
Insulation (ceiling)	R-49	735	365	50%
Insulation (2x4 wall)	R-13	158	148	94%

Measure Name	Measure Description	Projected Installations	Actual Installations	Percentage of Projected
Insulation (2x6 wall)	R-20 or R-13 w/ R-5 sheathing	79	2	3%
Insulation (basement wall)	R-15	126	100	79%
Insulation (foundation)	R-15	5	57	1,140%
Insulation (floor)	R-30*	11	28	255%
Insulation (rim and band joist)	R-10	5	172	3,440%
Infiltration Control	Caulking and Weather Stripping Installation with Blower Door Test	210	6	3%
Thermal Door	ENERGY STAR door (R-4.8 or U-0.20)	63	15	24%
Water Heater	0.67 to 0.79 EF storage	105	268	255%
Water Heater	Greater than 0.80 EF or 90% thermal efficiency condensing or tankless	11	172	1,564%
Water Heater	Replacement before end of life (storage), minimum EF = 0.67	52	17	33%
Water Heater	DHW Tankless On-Demand - Residential Grade	-	144	-
Clothes Washer	ENERGY STAR clothes washer	1,300	181	14%
Total Measures Installed		10,801	10,649	99%
Rebate Bundle	10% bonus incentive on top of rebate package if minimum of three residential prescriptive measures are installed within the program year	525	301	57%

Table 13 summarizes the total number of savings (MCF) per measure. Black Hills Energy's two highest total energy-savings measures in 2015 were furnaces of 96% AFUE or greater and furnace/boiler maintenance projects.

Table 13. Residential Prescriptive Program Savings by Measure

Measure Name	Measure Description	Projected Savings (MCF)	Savings (MCF)	Percentage of Projected
Furnace	96% AFUE or greater	4,593.6	30,488.3	733%
Furnace	94% to 95.9% AFUE	18,000.0	12,877.2	72%
Boiler	95% AFUE or greater	428.4	387.7	105%
Gas Fireplace	70% AFUE or greater, intermittent ignition, heat rated, thermostatic control with blower	3.5	45.1	1289%
Duct Sealing	8 CFM/100 square feet of CFA	158.4	-	0%
Integrated Space and Water Heater	Integrated space and water heater	176.5	39.2	22%
	≥ 84% CAE or 95% boiler indirect-fired water heater			
Multizone Thermostat	Individual room temperature control for major occupied rooms	28.1	28.7	102%
Furnace/Boiler Maintenance	Furnace and/or boiler maintenance	11,082	13,686.6	124%
Setback Thermostat	5-1-1, 5-2, or 7-day (customer installation)	220.5	92.3	42%
Setback Thermostat	5-1-1, 5-2, or 7-day (professional installation)	4,189.5	2,597.1	62%
Wi-Fi Programmable Thermostat	Wi-Fi programmable thermostat	55.1	705.9	1281%
Furnace/Boiler Maintenance and Setback Thermostat	Furnace/Boiler maintenance and setback thermostat (professional installation)	863.9	385.0	45%
Insulation (ceiling)	R-49	5,148.4	2,556.6	50%
Insulation (2x4 wall)	R-13	4,042.9	3,799.0	94%
Insulation (2x6 wall)	R-20 or R-13 w/ R-5 sheathing	2,367.1	60.1	3%
Insulation (basement wall)	R-15	1,429.4	1,134.5	79%
Insulation (foundation)	R-15	59.6	646.7	1085%
Insulation (floor)	R-30*	53.8	143.4	267%
Insulation (rim and band joist)	R-10	7.7	250.9	3258%
Infiltration Control	Caulking and Weather Stripping Installation with Blower Door Test	950.4	27.2	3%
Thermal Door	ENERGY STAR door (R-4.8 or U-0.20)	33.2	7.9	24%
Water Heater	0.67 to 0.79 EF storage	157.5	271.8	173%

Measure Name	Measure Description	Projected Savings (MCF)	Savings (MCF)	Percentage of Projected
Water Heater	Greater than 0.80 EF or 90% thermal efficiency condensing or tankless	53	132.9	251%
Water Heater	Replacement before end of life (storage), minimum EF = 0.67	189	61.5	33%
Water Heater	DHW Tankless On-Demand - Residential Grade	545	792.0	145%
Clothes Washer	ENERGY STAR clothes washer	1,950	276.1	14%
Total		56,786.7	71,493.7	126%

Table 14 summarizes the total quantity and value of dealer spiffs paid per measure. Black Hills Energy paid the highest number of spiffs for furnace installations.

Table 14. Residential Prescriptive Program Dealer Spiff Summary

Measure Name	Measure Description	Applications Completed	Spiff Amount	Total
Furnace	≥ 96% AFUE	571	$150	$85,650
Furnace	≥ 94% AFUE	168	$150	$25,200
Boiler ≤ 300 kBtuh	≥ 95% AFUE	19	$150	$2,850
Integrated Space and Water Heater	Integrated space and water heater ≥ 84% CAE or 95% boiler indirect-fired water heater	1	$175	$175
Multizone Thermostat	Individual room temperature control for major occupied rooms	1	$60	$60
Water Heater	≥ 0.67 & ENERGY STAR-qualified storage	21	$10	$210
Water Heater	≥ 0.80 EF or ≥ 90% TE and ≥ 40 gallon storage/condensing/tankless	7	$60	$420
Water Heater	Replacement before end-of-life (storage), ≥ 0.67 EF & ENERGY STAR qualified & ≤ 11 years old	0	$10	$0
Total		788		$114,565

Participation

Installations for 2015 were projected at 11,705. Actual program installations totaled 10,662.

Budget

The proposed budget for 2015 was $2,480,100. Actual program expenditures equaled $2,920,533.

Savings

Black Hills Energy projected program savings of 56,787 MCF for 2015. The program achieved actual savings of 71,494 MCF.

Cost-Effectiveness Results

Table 15 lists cost-effectiveness analysis results for the Residential Prescriptive Program, based on 2015 program activity.

Table 15. Residential Prescriptive Program Cost-Effectiveness Results

Cost-Effectiveness Test	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
Societal Cost (SCT)	$7,472,569	$8,678,410	$1,205,841	1.16
Utility Cost Test (UCT)	$2,920,533	$5,343,574	$2,423,040	1.83
Ratepayer Impact (RIM)	$8,338,851	$5,343,574	($2,995,277)	0.64
Participant Cost (PCT)	$7,118,365	$7,713,031	$594,666	1.08

Highlights and Challenges

Residential Prescriptive rebates remain a strong program for Black Hills Energy. As in past years, the anticipated measure mix was slightly different than anticipated, resulting in higher savings. The spiff program continues to be a strong avenue for increasing the number of high-efficiency measures installed in Black Hills Energy's customers' homes.

However, low gas prices have led to less concern over energy efficiency for Black Hills Energy's customers, which results in slightly lower than anticipated levels of participation.

R.3 – Residential New Construction Program

Program Description

Black Hills Energy designed the Residential New Construction Program to promote construction of energy-efficient, single-family and multifamily homes by providing incentives to new home builders for installing high-efficiency, natural gas-fired space and water heating equipment, along with more robust thermal envelope measures.

In July 2014, Black Hills Energy decided to create two tiers in the Residential New Construction program by removing the drain water heat recovery (DWHR) requirement, seeking to spur program participation. Feedback from builders indicated the DWHR requirement did not hinder participation; rather, insulation requirements (R-20+5, possibly adding $3,000–$5,000 in construction costs) posed an issue.

After this feedback, Black Hills Energy decided to move away from the tiered approach and attempted to capture these new homes in a more prescriptive manner for 2015. In 2015, the program removed the envelope measures and added ENERGY STAR or eligible clothes washers.

Program Summary

Table 16 compares program budgets and goals to actual 2015 program performance.

Table 16. Residential New Construction Program Summary

	Projected	Actual	Percentage of Projected Achieved
Participation	473	1	<1%
Expenditures	$506,800	$140,679	28%
Energy Savings (MCF)	9,720	13	<1%
Demand Impacts (MCF/day)	106	0.1	<1%

Measures and Rebates

Participating homebuilders could meet the program's efficiency standards by installing required equipment from the eligible measures, as specified in Table 17. Builders could also apply for additional rebates under the Residential Prescriptive Program.

Table 17. Residential New Construction Prescriptive Program Measure Summary

Measure Name	Requirement	Eligible Measures	Incentive	Bonus Incentive
Furnace	Select one eligible measure to install	≥ 94% AFUE	$400	$100
		≥ 96% AFUE	$600	
Water Heater	Select one eligible measure to install	≥ 0.67 storage	$150	
		≥ 0.80 EF or ≥ 90% TE condensing	$300	
		≥ 0.80 EF tankless	$300	
Clothes Washers	N/A	ENERGY STAR or qualified standard Clothes Washer MEF ≥ 2.0 and WF ≥ 6.0	$50	N/A

Participation

Despite projected participation of 473 in 2015, the program had only one participant for the year.

Budget

The proposed annual budget was $506,800 for 2015. Actual budget expenditures equaled $140,679.

Savings

Though Black Hills Energy projected savings of 9,720 MCF for 2015, the program realized only 13 MCF from a single participant.

Cost-Effectiveness Results

Table 18 lists cost-effectiveness analysis results, based on 2015 program activity.

Table 18. Residential New Construction Program Cost-Effectiveness Results

Cost-Effectiveness Test	Costs	Benefits	Net Benefits	Benefit / Cost Ratio
Societal Cost (SCT)	$142,425	$2,121	($140,305)	0.01
Utility Cost Test (UCT)	$140,679	$1,090	($139,589)	0.01
Ratepayer Impact (RIM)	$141,780	$1,090	($140,690)	0.01
Participant Cost (PCT)	$1,746	$1,042	($705)	0.60

Highlights and Challenges

The Residential New Construction Program continued to struggle in 2015, because of the higher construction costs required to comply with the program requirements. Many new homes built in 2015, however, did install high efficiency furnaces, and those projects were captured in the Residential Prescriptive Rebate Program.

2. Nonresidential Programs

Introduction

This chapter describes Black Hills Energy's portfolio of nonresidential energy efficiency programs. It begins by examining overall cost-effectiveness for the sector portfolio and includes detailed descriptions of each program. Table 19 lists Black Hills Energy's portfolio of nonresidential programs.

Table 19. Black Hills Energy Nonresidential Programs

Program
NR.1 – Nonresidential Evaluation
NR.2 – Nonresidential Prescriptive
NR.3 – Nonresidential Custom
NR.4 – Nonresidential New Construction

Nonresidential Sector Portfolio Cost-Effectiveness

Table 20 shows the cost-effectiveness of the four nonresidential programs.

Table 20. Nonresidential Programs' Cost-Effectiveness Results

Cost-Effectiveness Test	Costs	Benefits	Net Benefits	Benefit / Cost Ratio
Societal Cost (SCT)	$2,023,116	$4,342,316	$2,319,200	2.15
Utility Cost Test (UCT)	$1,005,993	$2,686,566	$1,680,573	2.67
Ratepayer Impact (RIM)	$3,710,982	$2,686,566	($1,024,416)	0.72
Participant Cost (PCT)	$1,523,248	$3,075,198	$1,551,950	2.02

NR.1 – Nonresidential Evaluation Program

Program Description

The Nonresidential Evaluation Program has two commercial components—a small commercial evaluation and a large commercial evaluation—and one industrial outreach component. Black Hills Energy offers the two commercial components to provide customers of small and large facilities access to on-site energy evaluations. Through the industrial outreach component, Black Hills Energy provides free industrial on-site energy evaluations. The commercial and industrial evaluations include recommendations for methods customers can use to reduce their energy consumption.

Initially small commercial customers (i.e., businesses with less than 25,000 square feet) could procure a professional evaluator to conduct an on-site examination of their business and offer customized recommendations for a small fee ($50). These recommendations address heating systems, hot water use, building envelopes, and commercial cooking. In addition, the evaluator may install up to $50 in low-cost, energy-saving measures. In 2015, Black Hills Energy waived

the $50 fee for small commercial evaluations, seeking to increase program participation. As the Nonresidential Evaluation Program acts as a gateway to the Nonresidential Prescriptive Program, it was thought participation in that program also might increase.

Large commercial customers (i.e., businesses larger than 25,000 square feet) may receive a similar service for a $500 fee.

Customers receiving recommendations for shell measure improvements become eligible to obtain incentives through Black Hill Energy's Nonresidential Prescriptive Program. Additional qualifying measures may be submitted to the Nonresidential Custom Program.

Program Summary

Table 21 compares the program's budget and goals to actual 2015 program performance. The program obtains direct savings from leave-behind measures.

Table 21. Nonresidential Evaluation Program Summary

	Projected	Actual	Percentage of Projected Achieved
Total Participation	168	110	65%
Expenditures	$101,500	$152,246	150%
Energy Target (MCF)	336	45	13%
Demand Impacts (MCF/day)	3	0.2	7%

Table 22 summarizes participation by business size and installations by measure type. Business sites smaller than or equal to 25,000 square feet are classified as "Small Commercial," and businesses greater than 25,000 square feet are classified as "Large commercial."

Table 22. Nonresidential Evaluation Participation Summary

Business Size and Measure Type	Projected Participation and Installations	Actual Participation and Installations	Percentage of Projected Achieved
Small Commercial Participants	158	103	65%
Pipe Insulation	14	5	35%
Low-Flow Showerhead	5	1	21%
Flip Faucet Aerator (kitchen)	8	7	89%
Standard Faucet Aerator (bathroom)	130	11	8%
Total Direct Install Measures	156	24	15%
Large Commercial Participants	11	7	64%
Pipe Insulation	1	0	0%
Low-Flow Showerhead	0	0	0%
Flip Faucet Aerator (kitchen)	1	1	100%
Standard Faucet Aerator (bathroom)	9	0	0%
Total Direct Install Measures	11	1	9%

Table 23 summarizes savings by business size and measure type. Business sites smaller than or equal to 25,000 square feet are classified as "Small Commercial," and businesses greater than 25,000 square feet are classified as "Large commercial."

Table 23. Nonresidential Evaluation Savings Summary

Business Size and Measure Type	Projected Savings (MCF)	Actual Savings (MCF)	Percentage Projected Achieved
Small Commercial	315.3	42.8	14%
Pipe Insulation	1.1	0.4	38%
Low-Flow Showerhead	25.3	4.7	19%
Flip Faucet Aerator (kitchen)	17.4	14.6	84%
Standard Faucet Aerator (bathroom)	272.6	23.0	8%
Total Direct Install Measures	316.3	42.8	14%
Large Commercial	21.0	2.1	10%
Pipe Insulation	0.1	0.0	0%
Low-Flow Showerhead	1.7	0.0	0%
Flip Faucet Aerator (kitchen)	1.2	2.1	173%
Standard Faucet Aerator (bathroom)	18.7	0.0	0%
Total Direct Install Measures	21.7	2.1	10%

A primary purpose of the Nonresidential Evaluation Program is to identify potential savings in BHE's commercial customers' facilities. The customers are informed of incentives available through the Nonresidential Prescriptive Program. Table 24 lists the measures incented through the Nonresidential Prescriptive Program for participants in the Nonresidential Evaluation Program. Overall, 32% of the Nonresidential Evaluation Program participants also received incentives through the Nonresidential Prescriptive Program.

Table 24. Nonresidential Evaluation Conversion Rate and Nonresidential Prescriptive Measures Installed by Nonresidential Evaluation Participants

Nonresidential Prescriptive Measures	Installed	Percentage of Total
Insulation (roof) R-20 continuous	18	54.5%
Caulking and Weather-stripping	3	9.1%
RFR Measure	4	12.1%
Programmable thermostat (Professionally installed)	1	3.0%
Insulation (wall) R-13+R-7.5	4	12.1%
Furnace Tune-Up	1	3.0%
Condensing Furnace - 96 AFUE	1	3.0%
RBLR Measure	1	3.0%
Total	33	

Measures and Incentives

Commercial customers can receive (and/or have installed) the following free, low-cost measures:

- Water heater pipe insulation
- Low-flow showerheads
- Flip faucet aerators (kitchen)

- Standard faucet aerators (bathroom)
- Low-flow spray heads (commercial kitchen facilities only)

Participation
Though Black Hills Energy estimated 2015 participation at 168 commercial customers, 110 customers participated.

Budget
Of a $101,500 proposed budget for 2015, the program expended $152,246.

Savings
Black Hills Energy projected 336 MCF in savings from the 2015 program, but the program achieved actual savings of 45 MCF.

Cost-Effectiveness Results
Table 25 lists cost-effectiveness analysis results, based on 2015 program activity.

Table 25. Nonresidential Evaluation Program Cost-Effectiveness Results

Cost-Effectiveness Test	Costs	Benefits	Net Benefits	Benefit / Cost Ratio
Societal Cost (SCT)	$164,448	$2,844	($161,604)	0.02
Utility Cost Test (UCT)	$152,246	$2,132	($150,114)	0.01
Ratepayer Impact (RIM)	$154,590	$2,132	($152,458)	0.01
Participant Cost (PCT)	$53,550	$43,622	($9,928)	0.81

Highlights and Challenges
Low natural gas prices have continued to cause lower than anticipated participation in the Nonresidential Evaluation Program because customers are less concerned with their energy bills. Many facility managers and store managers are also uncomfortable about approving some of the direct install measures, resulting in lower than anticipated savings in this program.

NR.2 – Nonresidential Prescriptive Program

Program Description
The Nonresidential Prescriptive Program, which primarily focuses on the small business sector, provides a full range of energy efficiency options for space and water heating and for commercial cooking equipment. This program offers cash rebates to nonresidential customers for the purchase of high-efficiency natural gas equipment, and offers incentives to dealers selling eligible equipment.

Program Summary
Table 26 compares the program budget and goals to actual 2015 program performance.

Table 26. Nonresidential Prescriptive Program Summary

	Projected	Actual	Percentage of Projected Achieved
Participation	839	650	77%
Expenditures	$826,000	$549,092	66%
Energy Savings (MCF)	14,719	26,555	180%
Demand Impacts (MCF/day)	149	311	209%

Measures and Rebates

The Nonresidential Prescriptive Program offers incentives similar to those available for residential customers using similar equipment. The incentives are designed to cover up to one-half of a measure's incremental cost. The program includes tiered incentive levels to promote higher-efficiency measures.

As part of a QA/QC process, Black Hills Energy requires all space heating equipment to bear the Air-Conditioning, Heating, and Refrigeration Institute (AHRI) Certified mark. Water heaters must include either AHRI certification or be listed as ENERGY STAR-qualified units. In addition, to promote these high-efficiency measures, Black Hills Energy offers dealer spiffs to encourage them to promote and stock high-efficiency equipment.

To help ensure properly sized and installed furnaces, the dealer spiff for those units depends on receiving documentation that shows proper installation practices and/or requiring contractors to complete a training course. Contractors submitting applications for quality installation spiffs must use either the Save software or be NATE-certified.

Table 27 lists the eligible measures and their corresponding incentive levels.

Table 27. Nonresidential Prescriptive Program Measure Summary

Measure Name	Measure Description	Base Equipment	Proposed Incentive	Dealer Spiff
Nonresidential Prescriptive				
Broiler	≥ 34% EF	15% efficient	$100	$10
Convection Oven	ENERGY STAR qualified	Standard	$200	$20
Conveyor Oven	≥ 40% Efficiency with thermostatic controls	15% efficient	$1,350	$50
Fryer	ENERGY STAR qualified	Standard	$525	$50
Griddle	ENERGY STAR qualified	32% efficient	$600	$50
Steam Cooker	ENERGY STAR qualified	Standard	$1,000	$50
Rotisserie Oven	≥ 31% EF	EF 25% standard oven	$1,350	$50
Rotating Rack Oven	≥ 40% EF	EF 25% deck oven	$1,500	$50
Char Broiler	≥ 38% EF	EF 33% standard char broiler	$1,100	$50
Salamander Broiler	≥ 35% EF	Conversion of radiant to infrared; EF 22.5% broiler	$525	$50

Measure Name	Measure Description	Base Equipment	Proposed Incentive	Dealer Spiff
Nonresidential Prescriptive				
Duct Repair, Sealing, and Insulation Package	Reduction in duct losses to 5% and new duct insulation (R-8 in unconditioned spaces)	No repair or sealing, 15% duct losses; no insulation	$0.45/linear foot	
Duct Insulation	New duct insulation (R-8 in unconditioned spaces)	No insulation	$0.30/linear foot	
Furnace	≥ 94% AFUE	Federal standard 78% AFUE	$400	$150
Furnace	≥ 96% AFUE	Federal standard 78% AFUE	$600	$150
Furnace/Boiler Maintenance	Furnace and/or boiler maintenance	Unmaintained furnace/boiler	$100	
Boiler ≤ 300 kBtuh	≥ 90% AFUE	82% AFUE standard boiler	$800	$150
Boiler ≤ 300 kBtuh	≥ 95% AFUE	82% AFUE standard boiler	$1,200	$150
Setback Thermostat	Programmable thermostats 5-1-1, 5-2, or 7-day (professional installation)	Manual thermostat	Up to $70	
Setback Thermostat	Programmable thermostats 5-1-1, 5-2, or 7-day (self-installation)	Manual thermostat	Up to $50	
Spa Covers	≥ R-14	No cover	$50	
Swimming Pool Covers	Transparent	No cover	$250	
Thermal Doors	R-3 or U-Factor = 0.35	Standard door (U-Factor = 0.55)	$25	
Infiltration Control	Weather-stripping	Standard practice	70% of total cost up to $1,500	
Insulation (floor, roof, wall)	R-30 of max fill floor R-20 continuous insulation (roof) R-13 + R-7.5 (wall)	Average existing insulation (R-10)	Lesser of 70% installed cost or $0.30/SF	
Vent Damper	For natural gas boilers	No damper	$160	
Water Heater	≥ 0.67 EF or 85% TE and ≤ 60 gallon storage	Standard water heater (federal standard)	$150	$10
Water Heater	≥ 0.80 EF or 90% TE and ≤ 60 gallon condensing or tankless	Standard water heater (federal standard)	$300	$60

Table 28 summarizes the total number of installations per measure.

Table 28. Nonresidential Prescriptive Program Installations by Measure

Measure Name	Measure Description	Projected Installations*	Actual Installations	Percentage of Projected
Fryer	ENERGY STAR	1	1	100%
Furnace	94% to 95.9% AFUE	105	94	90%
Furnace	96% AFUE or greater	26	140	538%
Furnace/Boiler Maintenance	Furnace and/or boiler maintenance	68	117	172%
Boiler < 300 kBtuh	90% to 94.9% AFUE	20	7	35%
Boiler < 300 kBtuh	95% or greater AFUE	20	34	170%
Setback Thermostat	5-1-1, 5-2, or 7-day (professional installation)	210	158	75%
Setback Thermostat	5-1-1, 5-2, or 7-day (self-installation)	5	10	200%
Doors	U-Factor = 0.35	11	2	18%
Infiltration Control	Weather-stripping	21	18	86%
Insulation (roof)	R-20 continuous insulation	53	33	62%
Insulation (wall)	R-13 + R-7.5	16	17	106%
Water Heater	0.67 to 0.79 EF storage	2	4	200%
Water Heater	Greater than 0.80 EF or 90% thermal efficiency condensing or tankless	22	15	68%
Total Measures		580	650	112%

* Excludes measures with no participation

Table 29 summarizes the total number of savings (MCF) per measure. In 2015, Black Hills Energy's two measures achieving the highest total energy savings were furnaces and boilers.

Table 29. Nonresidential Prescriptive Program Savings by Measure

Measure Name	Measure Description	Projected Savings (MCF)*	Actual Savings (MCF)	Percentage of Projected
Fryer	ENERGY STAR	53.1	50.5	95%
Furnace	94% to 95.9% AFUE	4,296.2	6,490.4	151%
Furnace	96% AFUE or greater	1,183.2	10,984.6	928%
Furnace/Boiler Maintenance	Furnace and/or boiler maintenance	1,435.1	2,840.6	198%
Boiler < 300 kBtuh	90% to 94.9% AFUE	851.0	328.0	39%
Boiler < 300 kBtuh	95% or greater AFUE	1,276.4	2,171.4	170%
Setback Thermostat	5-1-1, 5-2, or 7-day (professional installation)	3,373.7	2,129.4	63%
Setback Thermostat	5-1-1, 5-2, or 7-day (self-installation)	84.3	155.3	184%
Doors	U-Factor = 0.35	9.7	1.9	19%
Infiltration Control	Weather-stripping	348.0	818.8	235%
Insulation (roof)	R-20 continuous insulation	296.0	218.5	74%
Insulation (wall)	R-13 + R-7.5	355.3	223.7	63%
Water Heater	0.67 to 0.79 EF storage	19.4	21.2	109%

Measure Name	Measure Description	Projected Savings (MCF)*	Actual Savings (MCF)	Percentage of Projected
Water Heater	Greater than 0.80 EF or 90% thermal efficiency condensing or tankless	417.2	120.7	29%
Total Savings		14,210.5	26,554.8	187%

* Excludes measures with no participation

Table 30 summarizes the total quantity and value of dealer spiffs paid per measure. Black Hills Energy paid the highest number of spiffs for furnaces with ≥ 96% AFUE installations.

Table 30. Nonresidential Prescriptive Program Dealer Spiff Summary

Measure Name	Measure Description	Applications Completed	Dealer Spiff	Total
Furnace	≥ 94% AFUE	6	$150	$900
Furnace	≥ 96% AFUE	32	$150	$4,800
Boiler ≤ 300 kBtuh	≥ 90% AFUE	2	$150	$300
Boiler ≤ 300 kBtuh	≥ 95% AFUE	2	$150	$300
Water Heater	≥ 0.67 EF or 85% TE and ≤ 60 gallon storage	1	$10	$10
Total		43		$6,310

Participation

In 2015, Black Hills Energy projected 839 measure installations. The program achieved actual measure installations of 650.

Budget

Of the $826,000 proposed 2015 budget, the program expended $549,092.

Savings

Black Hills Energy projected 14,719 MCF in savings for the 2015 program; the program achieved savings of 26,555 MCF.

Cost-Effectiveness Results

Table 31 lists cost-effectiveness analysis results, based on 2015 program activity.

Table 31. Nonresidential Prescriptive Program Cost-Effectiveness Results

Cost-Effectiveness Test	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
Societal Cost (SCT)	$1,360,111	$3,371,964	$2,011,852	2.48
Utility Cost Test (UCT)	$549,092	$2,049,202	$1,500,110	3.73
Ratepayer Impact (RIM)	$2,611,318	$2,049,202	($562,116)	0.78
Participant Cost (PCT)	$1,084,496	$2,229,293	$1,144,797	2.06

Highlights and Challenges

Low natural gas prices continued to be an issue in achieving the anticipated levels of participation in the Nonresidential Prescriptive Program. However, the installed measure mix resulted in higher than expected savings and in a very cost-effective program.

NR.3 – Nonresidential Custom Program

Program Description

Through the Nonresidential Custom Program, Black Hills Energy provides customer incentives for the installation of energy-efficient natural gas equipment not specified in the Nonresidential Prescriptive Program. Generally, these include measures that would widely vary in cost, depending on facility specifics.

The Nonresidential Custom Program buys down energy-efficient upgrades to a two-year payback or up to one-half of the equipment's incremental cost (whichever is less), up to $3,000. In most cases, the program requires expert analyses to determine potential energy savings, base case, incremental costs, and other project parameters, and Black Hills Energy provides funding to support such analysis.

Black Hills Energy delivers this program through a third-party implementation contractor.

Program Summary

Table 32 compares the program budget and goals to actual 2015 program performance.

Table 32. Nonresidential Custom Program Summary

	Projected	Actual	Percentage of Projected Achieved
Participation	13	12	92%
Expenditures	$54,800	$95,262	174%
Energy Savings (MCF)	6,224	3,726	60%
Demand Impacts (MCF/day)	65	48	74%

Table 33 describes the types of projects and their associated savings for the Custom Nonresidential program.

Table 33. Nonresidential Custom Project Savings

Nonresidential Custom Project Type	Rebates Approved	Rebate	Measures Installed	Savings (MCF)
VAV System - Constant Volume	1	$12,930	1	2,155.0
High Efficiency Boiler	5	$13,753	6	920.6
Insulated Overhead Doors	1	$326	4	54.3
Window Upgrade - Energy Star Windows	2	$1,098	74	183.1
Fuel Fired Unit Heaters	1	$679	1	28.1
High Efficiency Hot Water Heater	1	$194	1	32.3
Building Envelope	1	$2,641	1	353.2
Total	12	$31,621	88	3,727

Measures and Rebates

Given the individual analysis conducted for each proposed project, the program could consider any technology if a customer could demonstrate the measure cost-effectively produced natural gas savings. Black Hills Energy expected, however, that most program activity would include applications of the following technologies:

- Boiler and furnace retrocommissioning
- Large boilers (> 300 kBtuh)
- Process-related equipment for industrial or agricultural customers
- Heat recovery devices and automated ventilation control sensors
- Boiler turbulators
- Direct-fired, make-up air units

Participation

Though Black Hills Energy projected 13 participants for the 2015 program, 12 actually participated.

Budget

Of the $54,800 proposed for the 2015 budget, the program expended $95, 262.

Savings

Though Black Hills Energy projected 6,224 MCF in program savings for 2015, the program achieved actual savings of 3,726 MCF.

Cost-Effectiveness Results

Table 34 lists cost-effectiveness analysis results, based on 2015 program activity.

Table 34. Nonresidential Custom Program Cost-Effectiveness Results

Cost-Effectiveness Test	Costs	Benefits	Net Benefits	Benefit / Cost Ratio
Societal Cost (SCT)	$108,784	$470,704	$361,920	4.33
Utility Cost Test (UCT)	$95,262	$300,345	$205,083	3.15
Ratepayer Impact (RIM)	$397,638	$300,345	($97,293)	0.76
Participant Cost (PCT)	$72,709	$346,659	$273,950	4.77

Highlights and Challenges

Enrolling projects with the potential for high savings has continued to be a challenge in the Custom Program. Many projects that would achieve large savings include transport customers who are ineligible to participate.

Black Hills did, however, remove a self-imposed $6/MCF limit in the Custom Program, which caused a spike in participation in the last quarter of 2015. The effects of this change should be seen in the 2016 program year.

NR.4 – Nonresidential New Construction Program

Program Description

The Nonresidential New Construction Program encourages nonresidential facility builders to build with energy efficiency in mind. The program covers new construction and major renovations, primarily in the commercial sector, although some multifamily and light industrial projects may qualify. Black Hills Energy offers program design assistance and incentives for the design team as well as incentives for the builder.

The program provides Energy Design Assistance, an energy modeling service designed to support energy efficiency decisions during a new construction or renovation project's design phase. Black Hills Energy provides this value-added service to owners and design teams to demonstrate cost savings, energy savings, and payback and incentive information before finalization of construction plans.

The Design Team Incentive is a fixed monetary amount, provided to the architect of record; this offsets time spent to support the owner's participation in the program.

The Construction incentive provides a monetary incentive to the building owner for implementation of energy-efficient equipment and strategies. The owner receives the Construction Incentive after completion of construction and of a verification visit and report. Each program track (1-4) includes all three program components (e.g., energy design assistance, design team incentive, construction incentive). The Energy Design Assistance component varies by delivery methods and analysis types for each track, as Table 36 (below) shows in greater detail.

Program Summary

Table 35 compares the program's budget and goals to actual 2015 program performance.

Table 35. Nonresidential New Construction Program Summary

	Projected	Actual	Percentage of Projected Achieved
Participation	8	7	88%
Expenditures	$217,100	$209,392	96%
Energy Target (MCF)	10,499	4,585	44%
Demand Impacts (MCF/day)	110	39	35%

Measures and Rebates

Energy efficiency strategies offered by the program include building shell/envelope and heating systems, with four tracks of available assistance, as shown in Table 36.

Table 36. Nonresidential New Construction Participation Tracks

Track	Square Footage	Minimum Energy Savings	Project Description	Services	Design Team Incentive	Construction Incentive
Track 1	5-15k	15%	Small Buildings	One meeting: building systems optimization for one to three systems (depending on building complexity); implementation verification.	$1,000	$0.06-$0.19/kWh $.60-$1.90/therm
Track 2	>15k	15%	Standard Efficiency Strategies	Two meetings: building systems optimization based on mechanical system selection; implementation verification	$3,500	$0.06-$0.19/kWh $.60-$1.90/therm
Track 3	>15k	15%	Custom Efficiency Strategies	Three meetings: building systems optimization for two complex systems; implementation verification	$5,500	$0.06-$0.19/kWh $.60-$1.90/therm
Track 4	>15k	40%	Advanced Custom Efficiency Strategies	Four + meetings: goal setting with module options of massing, daylighting and HVAC analysis; building system optimization for complex systems; certification support of LEED EA Optimize Energy Performance or ENERGY STAR; implementation verification.	$6,500 (one module) $7,500 (two module) $8,500 (two modules)	$0.17-$0.19/kWh $1.70-$1.90/therm

Participation

For the 2015 program, Black Hills Energy projected eight program participants and engaged seven participants.

Budget

Of the $217,100 proposed for 2015 budget, the program expended $209,392.

Savings

Black Hills Energy's savings projections remained unchanged from 2014. Black Hills Energy projected 10,499 MCF in savings for the 2015 program and achieved actual savings of 4,585 MCF.

Cost-Effectiveness Results

Table 37 lists results from the cost-effectiveness analysis, based on 2015 program activity.

Table 37. Nonresidential New Construction Program Cost-Effectiveness Results

Cost-Effectiveness Test	Costs	Benefits	Net Benefits	Benefit / Cost Ratio
Societal Cost (SCT)	$389,772	$496,803	$107,031	1.27
Utility Cost Test (UCT)	$209,392	$334,887	$125,494	1.60
Ratepayer Impact (RIM)	$547,435	$334,887	($212,549)	0.61
Participant Cost (PCT)	$312,493	$455,623	$143,130	1.46

Highlights and Challenges

Projects enrolled in the Nonresidential New Construction Program for Black Hills Energy were smaller than expected in 2015, which resulted in achieving 88% of projected participation but only 44% of savings goals. Many of these projects were enrolled in Track II or higher, which meant that the analysis came at a higher cost to Black Hills Energy. Finding projects that result in high gas savings also continues to be an issue because the majority of these are transport customers.

3. Low-Income Programs

Introduction

This chapter describes Black Hills Energy's portfolio of low-income energy efficiency programs. It begins with examining the sector portfolio's overall cost-effectiveness, including a detailed description of each program. Table 38 lists the low-income programs.

Table 38. Low-Income Programs

Program
LI.1 – Weatherization Program
LI.2 – Energy Education Program
LI.3 – Multifamily Efficiency Improvement Initiative Program
LI.4 – Affordable Homes Program
LI.5 – Weatherization Team Program
LI.6 – GIAC

The low-income programs provide energy-efficiency saving opportunities to the most vulnerable energy customers in the Iowa service area. Black Hills Energy coordinates with MidAmerican Energy Company and Alliant Energy through the Iowa Utility Association to deliver the following three programs:

- Low-Income Weatherization
- Low-Income Energy Education
- Low-Income Multifamily Efficiency Improvement Initiative

Low-Income Sector Cost-Effectiveness Results

Table 39 lists results from the cost-effectiveness analysis, based on 2015 program activity.

Table 39. Low-income Program Cost-Effectiveness Results

Cost-Effectiveness Test	Costs	Benefits	Net Benefits	Benefit / Cost Ratio
Societal Cost (SCT)	$786,252	$404,632	($381,620)	0.51
Utility Cost Test (UCT)	$771,531	$275,956	($495,575)	0.36
Ratepayer Impact (RIM)	$1,054,234	$275,956	($778,277)	0.26
Participant Cost (PCT)	$0	$912,477	$912,477	N/A

S.1 – Low-Income Weatherization Program

Program Description

The Low-Income Weatherization Program provides funding for weatherization efforts performed by local community action agencies (CAAs). Black Hills Energy provides this funding to the Iowa Department of Human Rights (DHR), which in turn distributes the funding to the CAAs.

Program Summary

Table 40 compares the program's budget and goals to actual 2015 program performance.

Table 40. Low-Income Weatherization Program Summary

	Projected	Actual	Percentage of Projected Achieved
Participation	113	110	97%
Expenditures	$614,400	$644,311	105%
Energy Target (MCF)	1,695	1,639	97%
Demand Impacts (MCF/day)	19	21	111%

Measures

The Low-Income Weatherization Program targets a broad range of low-income customers throughout Black Hills Energy's service territory. The CAAs deliver the weatherization improvements on behalf of Black Hills Energy, with measures including infiltration, insulation, energy efficiency equipment, and direct-install measures, such as the following:

- Building shell and heating system inspections and adjustments (e.g., cleaning furnace and caulking)
- Wall insulation
- Ceiling insulation
- Infiltration reduction
- Foundation/crawlspace insulation
- Band joist insulation
- Hot water temperature turn-down
- Water heater wraps
- Pipe insulation
- Low-flow showerheads
- Faucet aerators

Participation

For 2015, Black Hills Energy projected 113 participants; 110 engaged with the program.

Program Budget

Of the $614,400 proposed for the 2015 budget, the program expended $644,311.

Savings

Black Hills Energy estimated savings of 1,695 MCF for 2015 and achieved 1,639 MCF.

Highlights and Challenges

The Low Income Weatherization program through the Iowa Department of Human Rights (DHR) continues to be a strong performer for Black Hills Energy.

S.2 – Low-Income Energy Education Program

Program Description

Black Hills Energy provides energy education materials and low-cost efficiency measures to customers qualifying for energy assistance. The program helps eligible customers reduce their overall energy burdens. Delivered through local CAAs, participants attend a one-hour workshop or receive home visits by agency staff. During energy education sessions, participants receive a Home Savings Kit. Once they install the kit's various measures and take additional energy-saving actions, participants complete a short survey and return it to their agency. With joint funding from the Alliant Energy-IPL and MidAmerican Energy, the program provided energy education to 3,500 homes during the 2015 heating season.

Program Summary

Table 41 compares the program's budget and goals to actual 2015 program performance.

Table 41. Low-Income Energy Education Program Summary

	Projected	Actual	Percentage of Projected Achieved
Participation	3,000	3,500	117%
Expenditures	$23,500	$69,405	295%
Energy Target (MCF)	969	2,562	264%
Demand Impacts (MCF/day)	11	28	255%

Measures

In addition to education offered through the program, Black Hills Energy provides low-cost efficiency measures to participants. Direct-install measures provided in 2015 included the following:

- Three CFLs: two 13-watt bulbs (equivalent to 60-watt incandescents) and one 18-watt (equivalent to 75-watt incandescents)
- High-efficiency showerhead: 1.75 gallons per minute (GPM)
- Faucet aerators for kitchens and bathrooms
- A Filter Tone™ air filter alarm for furnaces or air conditioners
- Digital thermometer to test temperature in rooms, of hot water, and inside refrigerators and freezers
- A water-flow measurement bag
- Rope caulk
- Window wrap kit

Participation

Though the program expected to engage 3,000 participants in 2015, the program engaged with 3,500 participants.

Program Budget
For 2015, the program had a proposed budget of $23,500 and expended $69,405. The overage is due to an increase in the cost the kits, an additional 500 kits being allocated and the EMV work performed for this program.

Savings
Black Hills Energy projected estimated savings of 969 MCF associated with its program; actual savings were 2,562 MCF.

Highlights and Challenges
The Low Income Energy Education Program continues to help improve energy efficiency in homes across Black Hills Energy territory. In 2015, an additional 500 kits were requested. This requested amount, in addition to applying updated savings algorithms, resulted in much higher than anticipated savings.

S.3 – Low-Income Multifamily Efficiency Improvement Initiative

Program Description
Black Hills Energy has actively participated in developing the Multifamily Efficiency Improvement Initiative with the Iowa Finance Authority and with other major Iowa utilities. This program provides low-cost measures and enhanced incentives to owners and developers of affordable multifamily housing. Black Hills Energy offers an incentive equaling 40% of installed costs for when projects determined as cost-effective. When projects do not qualify as cost-effective, Black Hills Energy provides incentives of up to five times the annual savings estimate.

Program Summary
Table 42 compares the program's budget and goals to actual 2015 program performance.

Table 42. Low-Income Multifamily Program Summary

	Projected	Actual	Percentage of Projected Achieved
Participation	1	10	1,000%
Expenditures	$14,800	$44,169	298%
Energy Target (MCF)	2	361	18,034%
Demand Impacts (MCF/day)	0.02	1.0	4,813%

Measures
In addition to financial incentives offered through the program, Black Hills Energy provides energy-efficient direct-installation measures for participating rental units. The following energy-saving measures are included:

- Low-flow kitchen and bathroom faucet aerators
- Hot water pipe insulation
- Low-flow showerheads

Participation
Black Hills Energy projected two participants for 2015, and engaged 10 program participants.

Program Budget
Of the $14,800 proposed for the 2015 budget, the program expended $44,169.

Savings
Black Hills Energy estimated savings of 2 MCF in 2015 and achieved 361 MCF.

Highlights and Challenges
The Low Income Multifamily Efficiency Improvement Initiative had a standout year. By redefining what constituted "Low Income Multifamily," the implementation contractor was able to reach many more participants than originally anticipated. By instituting a direct install policy of all low-cost measures (as opposed to a leave-behind delivery method), the program was able to achieve much higher than anticipated savings.

S.4 – Low-Income Affordable Housing

Program Description
Black Hills Energy offers enhanced incentives for residential homes built by nonprofit organizations such as Habitat for Humanity, Community Housing Initiatives, and Community Action Corporations. Black Hills Energy provides $1,100 per new home that meets the Low-Income Affordable Housing Program's requirements. In addition to meeting these, participants must install an ENERGY STAR clothes washer and natural gas dryer. Black Hills Energy coordinates the program with the Trees Forever Program by encouraging program participants to identify opportunities for planting trees at new construction sites.

Program Summary
Table 43 compares the program's budget and goals to actual 2015 program performance.

Table 43. Low-Income Affordable Housing Program Summary

	Projected	Actual	Percentage of Projected Achieved
Participation	3	0	0%
Expenditures	$3,600	$3,549	99%
Energy Target (MCF)	37	-	0%
Demand Impacts (MCF/day)	0.40	0	0%

Participation
Though Black Hills Energy projected three participants for 2015, no participants enrolled with the program.

Program Budget
Of $3,600 proposed for the 2015 budget, the program expended $3,549.

Savings
Black Hills Energy projected 37 MCF in savings, but did not achieve any savings (due to an absence of participants).

Highlights and Challenges
Ensuring that staff members at the various agencies are aware of the program and up to date on program parameters has been difficult, but Black Hills Energy has been successful in reaching out to several of these organizations in 2015, which it hopes will lead to participation in 2016.

S.5 – Weatherization Team

Program Description
Black Hills Energy's Weatherization Team brings together volunteers from the company's staff and the community to offer simple weatherization measures and services to low-income households across Black Hills Energy's service territory. Prior to the volunteer work day, Black Hills Energy provides a complete energy evaluation of each selected home. This evaluation identifies simple infiltration reduction opportunities, low-cost, energy-efficient retrofits, and minor repairs to increase the home's energy efficiency.

Program Summary
Table 44 compares the program's budget and goals to actual 2015 program performance.

Table 44. Low-Income Weatherization Team Program Summary

	Projected	Actual	Percentage of Projected Achieved
Participation	110	25	23%
Expenditures	$15,700	$10,097	64%
Energy Target (MCF)	779	177	23%
Demand Impacts (MCF/day)	9	2	21%

Measures
The Weatherization Team provides the following services at no cost:

- Caulking around doors and windows
- Weather-stripping around door and windows
- Installing door sweeps
- Installing plastic window film on interiors and exteriors
- Filling/sealing holes in sidewalls and foundations

The Weatherization Team also provides the following measures at no cost:

- Hot water heater blankets
- Hot water pipe insulation
- Furnace filter replacements
- Low-flow showerheads
- Programmable thermostats
- Kitchen and bathroom low-flow faucet aerators

In addition, the Weatherization Team performs a number of health and safety home improvements.

Participation

For 2015, Black Hills Energy projected 110 participants and engaged 25 participants.

Program Budget

Of $15,700 proposed for the 2015 budget, the program expended $10,097.

Savings

Black Hills Energy's projected 779 MCF in savings and realized 177 MCF in estimated savings.

Highlights and Challenges

In 2015, Black Hills Energy partnered with local Chambers of Commerce in Maquoketa and Dubuque to try to increase participation in this program. This led to higher participation than Black Hills Energy has seen in the past, even though participation and savings goals were not met. However, accurate recordkeeping was a challenge. A new form has been created to alleviate such issues moving forward.

S.6 – Low-Income Green Iowa AmeriCorps

Program Description

Green Iowa AmeriCorps' (GIAC) mission strives to help Iowans become more energy efficient through residential weatherization, energy education, and community outreach services.[4] The target audience includes low-income, income-limited, elderly, veteran, and disabled customers, in addition to those on community action program waitlists. Through this program, Black Hills Energy provides support to GIAC staff to perform home evaluations and to weatherize homes at no cost to the renter or homeowner.

Program Summary

Table 45 compares the program's budget and goals to actual 2015 program performance.

[4] More information about GIAC is available online at www.greeniowaamericorps.org.

Table 45. Low-Income GIAC Program Summary

	Projected	Actual	Percentage of Projected Achieved
Participation	300	59	20%
Expenditures	$22,000	$0	0%
Energy Target (MCF)	780	153	20%
Demand Impacts (MCF/day)	9	2	19%

Measures

GIAC provides energy evaluations and the following measures at no cost:

- Air infiltration improvements (e.g., caulking and weather-stripping)
- Hot water pipe insulation
- Low-flow aerators
- Water heater thermostat setbacks

Participation

For the 2015 program, Black Hills Energy projected 300 participants and engaged 59 participants.

Program Budget

Of $22,000 proposed for the 2015 budget, the program expended $0.

Savings

Black Hills Energy projected 780 MCF savings in 2015. The program realized achieved actual savings of 153 MCF.

Highlights and Challenges

Working with local CAAs and CAP agencies to find a way to reach the target market has been a challenge for GIAC and Black Hills Energy, because confidentiality issues make access to waitlists impossible. Black Hills Energy and GIAC are working with local agencies and state leadership to find a solution to this issue.

4. Public Purpose Programs

Introduction

This chapter presents Black Hills Energy's public purpose programs, which seek to lend value to the utility's customers and Iowa's citizens or to meet the specific needs of special customer classes. The chapter begins with an examination of the public purpose programs' overall cost-effectiveness, followed by a detailed description of each program. Table 46 lists these programs.

Table 46. Public Purpose Programs

Program
PP.1 School-Based Energy Education Program
PP.2 Tree Planting Programs
PP.3 Iowa Energy Center and Center for Global and Regional Environmental Research

Public Purpose Sector Cost-Effectiveness Results

Table 47 lists cost-effectiveness analysis results, based on 2015 program activity.

Table 47. Public Purpose Program's Cost-Effectiveness Results

Cost-Effectiveness Test	Costs	Benefits	Net Benefits	Benefit / Cost Ratio
Societal Cost (SCT)	$170,314	$728,414	$558,100	4.28
Utility Cost Test (UCT)	$457,636	$430,332	($27,304)	0.94
Ratepayer Impact (RIM)	$892,898	$430,332	($462,566)	0.48
Participant Cost (PCT)	$0	$861,822	$861,822	N/A

PP.1 – School-Based Energy Education Program

Program Description

The School-Based Energy Education Program creates long-term energy savings via enhancing awareness of energy efficiency among youth within Black Hills Energy's service territory, built on the concept that energy efficiency awareness can be greatly increased among youth, who, compared to adults, more easily develop conservation-oriented mindsets regarding energy use in the home. A specific curriculum, designed to complement existing natural science-based education, serves as the primary means of engendering these subtle-yet-significant behavioral changes.

The program provides a kit of low-cost measures, designed to help energy-saving ideas and concepts resonate with participating students. The curriculum and kit provide educational and hands-on methods for teaching students to evaluate energy-efficient retrofit impacts and to change behaviors. For example, a flow meter accompanies the low-flow showerhead, permitting students to measure their water use before and after installation. Such comparisons provide concrete examples of actions that save energy and help the environment.

Program Summary

Table 48 compares program budget and goals to actual 2015 program performance.

Table 48. School-Based Energy Education Program Summary

	Projected	Actual	Percentage of Projected Achieved
Participation	1,734	3,600	208%
Expenditures	$82,900	$124,493	150%
Energy Savings (MCF)	3,728	3,780	101%
Demand Impacts (MCF/day)	41	41	101%

Measures

Each student and teacher participating in the program receives a kit that includes the following measures:

- Faucet aerators
- Flow meter
- Low-flow showerheads
- Low-cost infiltration measures
- Various educational materials (e.g., air temperature check cards)

Teachers also receive a complete energy-education curriculum, including recommended lesson plans, activities, and tests.

Participation

Black Hills Energy projected serving 1,734 students and their families in 2015, and served 3,600 students and families.

Program Budget

Of an $82,900 budget for 2015, the program expended $124,493.

Savings

Black Hills Energy projected 3,728 MCF in savings for 2015, and the program realized savings of 3,780 MCF.

Cost-Effectiveness Results

Table 49 lists cost-effectiveness analysis results, based on 2015 program activities.

Table 49. School-Based Energy Education Program Cost-Effectiveness Results

Cost-Effectiveness Test	Costs	Benefits	Net Benefits	Benefit / Cost Ratio
Societal Cost (SCT)	$162,000	$195,890	$33,890	1.21
Utility Cost Test (UCT)	$124,493	$157,559	$33,066	1.27
Ratepayer Impact (RIM)	$286,199	$157,559	($128,640)	0.55
Participant Cost (PCT)	$0	$282,869	$282,869	N/A

Highlights and Challenges

School Based Energy Education continues to be a strong program for Black Hills Energy. In 2015, Black Hills Energy had the opportunity to double the participation in this program. However, the implementation contractor changed its savings algorithms, resulting in a decrease in savings and causing the budget, savings, and participation numbers not to move in tandem.

PP.2 – Tree Planting Programs

Black Hills Energy provides annual funding for two tree planting programs: Trees Forever and Trees for Kids/Teens. Both programs encourage tree planting to save energy and improve the environment. Black Hills Energy recognizes the potential to incorporate tree planting with the Low-Income Affordable Housing Program and encourages program participants to identify opportunities for trees to be planted at new construction sites.

A nonprofit organization (of the same name) operates the Trees Forever Program. The organization emphasizes energy efficiency and conservation as it encourages and provides support for community-based tree planting efforts.

The Iowa Department of Natural Resources administers the Trees for Kids/Teens Program; through landscaping projects on school grounds, the program works to teach youth about the importance of planting trees. The program conducts education and tree planting hand-in-hand.

In total, the tree programs expended $138,314 in 2015. Black Hills Energy projected 998 participants (trees planted) and 211 MCF of savings and realized 2,647 MCF of savings from 1,832 trees planted.

PP.3 – Iowa Energy Center and Center for Global and Regional Environmental Research

Black Hills Energy provided funding through the energy efficiency planning process for the Iowa Energy Center and the Center for Global and Regional Environmental Research. Both organizations receive funding as a percentage of total revenues. Differences between budgeted and actual expenditures resulted from differences between expected and actual revenues. Black Hills Energy provided a total of $194,829 to support these organizations.

5. Appendices

Appendix A. Confidential Cost-Effectiveness Assumptions

Avoided Costs

Black Hills Energy generates natural gas-avoided costs, pursuant to the Iowa Utility Board rules for measure- and program-level cost-effectiveness tests, which contributed to the development of this energy efficiency plan. Table A-1 shows avoided energy costs;

Table A-1. Natural Gas Avoided Energy Costs

Year	Avoided Energy Cost ($/therm)
2015	$0.54
2016	$0.56
2017	$0.59
2018	$0.62
2019	$0.64
2020	$0.67
2021	$0.69
2022	$0.72
2023	$0.75
2024	$0.77
2025	$0.79
2026	$0.81
2027	$0.83
2028	$0.85
2029	$0.87
2030	$0.89
2031	$0.91
2032	$0.94
2033	$0.96
2034	$0.98
2035	$1.01
2036	$1.03
2037	$1.06
2038	$1.09
2039	$1.11
2040	$1.14

Table A-2 shows avoided capacity costs.

Table A-2. Natural Gas Avoided Capacity Costs

Year	Avoided Capacity Cost ($/peak therm-month)
2015	$0.70
2016	$0.72
2017	$0.74
2018	$0.76
2019	$0.78
2020	$0.80
2021	$0.82
2022	$0.84
2023	$0.86
2024	$0.88
2025	$0.90
2026	$0.92
2027	$0.95
2028	$0.97
2029	$0.99
2030	$1.02
2031	$1.04
2032	$1.07
2033	$1.10
2034	$1.12
2035	$1.15
2036	$1.18
2037	$1.21
2038	$1.24
2039	$1.27
2040	$1.30

Discount Rates

Other key parameters used in the analysis included discount rates, which varied depending on the cost-effectiveness test. Table A-3 summarizes these values and their associated data sources.

Table A-3. Discount Rates

	Rate	Data Source
Societal Cost Test Discount Rate	4.81%	Based on the 10-year T-bill average, October 2007
Utility Cost Test/Rate Impact Measure Test Discount Rate	7.51%	Utility avoided cost of capital
Participant Cost Test Discount Rate	10.0%	Assumption

Appendix B. Confidential Detailed Cost-Effectiveness Workbooks

Available as MS Excel workbooks.