

Policy and Regulatory Issues Governing the Use of Ground Source (Geothermal) Heat Pumps for Distributed Generation and Demand Side Management in Colorado: Opportunities for Utilities and Third-Party Providers

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Opportunities for Utilities

- HB07-1037 (§40-3.2-101 C.R.S. *et seq.*)
 - ⇒ Directs Colorado's investor-owned electric and gas utilities to pursue energy efficiency (Demand Side Management)
 - ⇒ Directed the PUC to develop new rules concerning gas DSM programs
 - Final rules adopted in Decision C08-0248 (Docket 07R-371G)
 - Rules became effective 30May2008

- HB08-1107 similarly attempted to require DSM for coops & munis but failed in the legislature.

Opportunities for Utilities

➤ There are six regulated gas utilities in Colorado

⇒ Atmos Energy

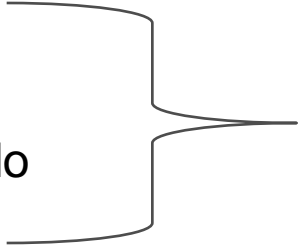
⇒ Colorado Natural Gas

⇒ Public Service Company of Colorado

⇒ SourceGas

⇒ Black Hills Energy Corp (approved in April,
operational in May)

⇒ Eastern Colorado (pending before the PUC)



Approved &
operational

➤ **None make any appreciable mention or use of GSHP in their DSM plans**

Opportunities for Utilities

DSM Expenditure Targets

➤ DSM program expenditure targets for gas utilities

⇒ §40-3.2-103(2)(a) C.R.S. directs the PUC to adopt “*DSM program expenditure targets equal to at least one-half of one percent of a natural gas utility’s revenues from its full service customers in the year prior to setting such targets.*”

⇒ Rule 4 CCR 723-4-4753(g)(l) states “*The utility’s annual expenditure target for DSM programs shall be, at a minimum **two percent of a natural gas utility’s base rate revenues** (exclusive of commodity costs), from its sales to customers in a 12-month calendar year period prior to setting the targets, **or one-half of one percent of total revenues** from its sales to customers in the 12-month calendar period prior to setting the targets, whichever is greater.*”

Opportunities for Utilities

DSM Savings Targets

➤ DSM program savings targets for gas utilities

⇒ §40-3.2-103(2)(b) C.R.S. directs the PUC to establish “*DSM program savings targets that are commensurate with program expenditures and express in terms of an amount of gas saved per unit of program expenditures.*”

⇒ Rule 4 CCR 723-4-4753(b) directs utilities to include in their gas DSM plans “The utility’s estimated annual natural gas energy savings for the DSM plan years, expressed in **dekatherms per dollar of expenditure...**”

Opportunities for Utilities

➤ DSM program cost recovery for gas utilities

⇒ §40-3.2-103(2)(c)(I) and (II) C.R.S. directs the PUC to adopt “*procedures for allowing gas utilities to recover their prudently incurred costs of DSM programs **without having to file a rate case.***”

⇒ Rules 4 CCR 723-4-4757 and 4758 set forth the procedure through which a utility may prepare a Gas DSM Cost Adjustment (G-DSMCA) rate rider.

⇒ The statute also directs the PUC to “*give gas utilities the option of obtaining cost recovery either through expensing DSM programs expenditures or adding them to base rates.*”

⇒ Rules 4756(a) and 4757(a) state that utilities may either amortize costs (and propose an appropriate amortization period), or expense costs with recovery of annual expenditures occurring over a one-year period.

Opportunities for Utilities

All Upside

...

- Other Gas DSM program elements – bonus structure and penalties
 - ⇒ §40-3.2-103(2)(d) C.R.S. directs the PUC to adopt “*a bonus structure to reward gas utilities for investments in cost-effective DSM programs.*”
 - ⇒ Rule 4 CCR 723-4-4754(g) delineates the terms and conditions under which a utility may receive a bonus based upon the utility’s performance relative to its energy savings target and expenditures per dekatherm relative to the unit cost target.
 - ⇒ §40-3.2-103(2)(f) C.R.S. precludes the PUC from adopting “*any measure authorizing a financial penalty against a gas utility that fails to meet the targets in any particular year.*” This prohibition was codified in Rule 4757(c).

Opportunities for Electric Utilities

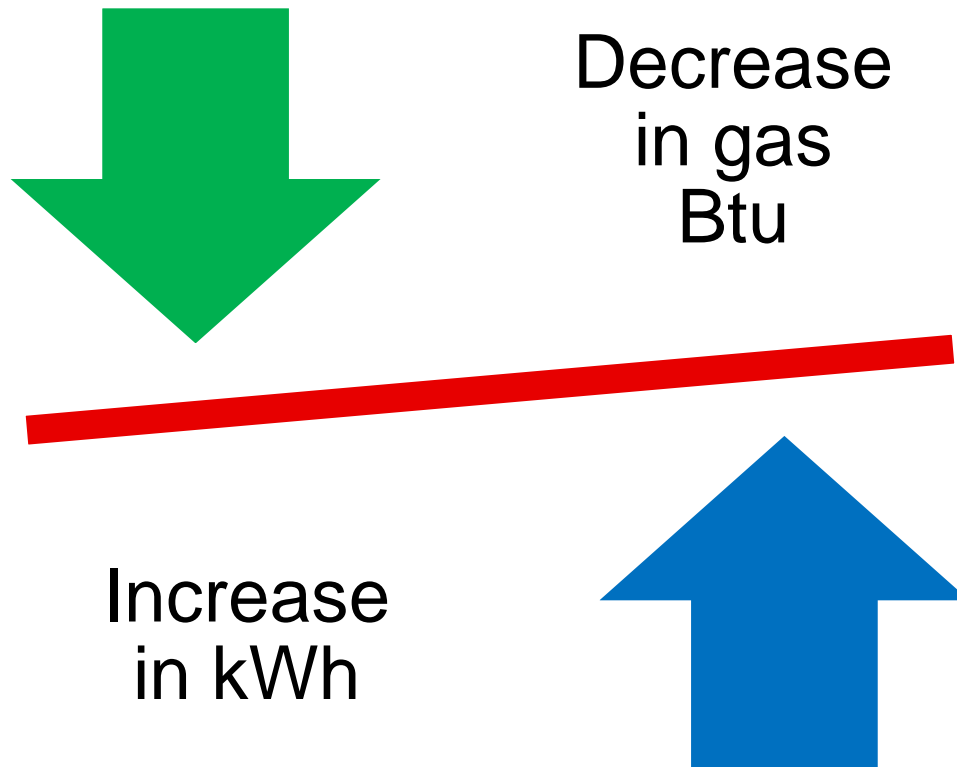
- HB07-1037 (2) (§40-3.2-101 et.seq. C.R.S.) directs the PUC to establish energy savings and peak demand reduction goals to be achieved by each regulated electric utility (PSCo and BHEC). The minimum goals are 5% of the utility's 2006 peak system demand and 5% of 2006 electric sales by 2018.
 - ⇒ Statutory minimum for PSCo: 331 MW and 1,382 GWh by 2018
 - ⇒ Statutory minimum for BHEC: 35.5 MW and 93.9 GWh by 2018
 - ⇒ PUC (Docket 07A-420E) set PSCo demand reduction of 886-944 MW by 2020 and total energy reduction of 3,082GWh for 2007-2018 (11% of 2006)
 - ⇒ These goals would achieve the energy-efficiency based carbon reduction targets contained in Governor's Climate Action Plan
 - ⇒ BHEC plan (Docket 08A-518E) is pending

- As with gas DSM, the electric utilities' DSM plans make no appreciable mention of or use of GSHP

- **Governor's Climate Action Plan would require all utilities (including munis and coops) to develop DSM programs**

Opportunities for Utilities

- GSHP to serve heating load:



None of the utility DSM plans submitted to the PUC integrate gas and electric usage for a total energy DSM

Opportunities for Utilities

Anticipated gas DSM savings from approved programs (in dekatherms)
(1 dekatherm = 1 million Btu)

Utility	2009	2010	Total
Atmos Energy	13,503	19,385	32,888
Black Hills Energy	372,277	482,831	855,108
Colorado Natural Gas	17,782	8,974	26,756
Eastern Colorado Utility	271	426	697
Public Service Co. of Colorado	318,141	402,808	720,949
SourceGas	18,565	23,643	42,208
TOTAL:	740,539 dkt	938,067 dkt	1,678,606 dkt

Source: PUC Report to the Colorado General Assembly on Demand Side Management, 28 April 2009

Opportunities for Utilities

Anticipated electric DSM savings from utility programs

Utility	2009 Anticipated Savings	2010 Anticipated Savings	Total
Black Hills: Energy Savings (MWh)	8,123	12,399	20,523
Black Hills: Demand Savings (MW)	2.2	4.0	6.2
Public Service Co: Energy Savings (MWh)	175,835	237,465	413,300
Public Service Co: Demand Savings (MW)	56.5	66.9	123.4
TOTALS:	183,958 MWh 58.7 MW	249,864 MWh 70.9 MW	433,822MWh 129.6 MW

Source: PUC Report to the Colorado General Assembly on Demand Side Management, 28 April 2009

Opportunities for Utilities

- Cost effectiveness of DSM programs is based on a *Total Resource Cost (TRC)* test

- Estimated cost effectiveness of approved gas DSM programs for 2009-2010
 - ⇒ Five plans with anticipated utility and participant expenditures of \$75.5 million
 - ⇒ Benefits to participants, the utility, and society of \$124.5 million over the lifetime of the investments.
 - ⇒ Benefit/cost ratio = \$1.65

- Estimated cost effectiveness of approved electric DSM programs for 2009-2010
 - ⇒ PSCo electric DSM plan anticipates utility and participant expenditures of \$193 million in 2009-10
 - ⇒ Benefits to participants, the utility, and society of \$652 million over the lifetime of the investments
 - ⇒ Benefit/cost ratio = \$3.38

Opportunities for Utilities

➤ What is the Total Resource Cost (TRC) Test?

⇒ Measures the economic efficiency of a DSM program from the perspective of society

⇒ Considers net costs of a program based on its total costs, including both participant and utility costs

⇒ Benefits

- Avoided supply costs

- Avoided participant costs (except utility bills)

⇒ Costs

- Utility program costs

- Participant's cost

⇒ Ignores impact on rates due to lost revenues

➤ Societal Cost Test

⇒ Essentially a TRC but adds societal benefits such as environmental externalities

Opportunities for Third-Party Providers

- Principal barrier is high first cost
- Learn from experience with another technology that has high first cost and long payback
 - ⇒ PV solar services model
- Geothermal Heat Suppliers Act, 1984
 - ⇒ Only exclusion from utility monopoly⁽¹⁾
- Third party would own and install system
 - ⇒ Sell metered thermal energy to customer

(1) SB09-154 now allows PV suppliers to sell electrical energy directly to end use customers

Geothermal Heat Suppliers Act

40-40-101 et. seq., C.R.S. (page 1 of 2)

- Defines *Geothermal Heat Supplier* as any person who supplies geothermally heated groundwater or other substances to the public or other customers for industrial process heat, commercial use, space heating, or other purposes. The term includes systems which enhance the thermal content of the substance supplied through the use of heat pumps, solar assistance, or other means.
 - ⇒ Exemptions for wholesale and publicly owned providers
- Requires the Commission to “establish a system of operating permits for geothermal heat suppliers. Before commencing construction of distribution facilities, a geothermal heat supplier must obtain an operating permit from the commission.”
- **An operating permit “may not be denied because the area which the applicant proposes to serve is already being served by a gas or electric utility.”**

Geothermal Heat Suppliers Act

40-40-101 et. seq., C.R.S. (page 2 of 2)

- The Act lists several requirements that must be met by the operator to obtain an operating permit including that the operator enter into a contract with the customer specifying:
 - ⇒ The period of time service will be provided
 - ⇒ Rates or method for determining rates to be charged
 - ⇒ That the operator will submit to complaint procedures contained in 40-6-108, C.R.S.

- Before issuing an operating permit, the commission must find that:
 - ⇒ The applicant is fit, willing, and able to provide the proposed services; and
 - ⇒ The applicant has made an adequate showing that the geothermal heat supply and distribution system appears reasonably capable of delivering the proposed services.

Difficulties in Analyzing GSHP for DSM Programs

- Using TRC to evaluate the trade-off of gas for electricity
 - ⇒ Gas utility receives benefits but transfers costs to electric utility
 - ⇒ Gas utility may not consider benefits due to cooling

- Benefits vary with the fuel/technology being displaced
 - ⇒ \$\$\$\$
 - ⇒ Energy balance
 - ⇒ CO2 balance

- Proper design is critical
 - ⇒ Climate
 - ⇒ Ground characteristics



Promoting and Deploying GSHP

- Rebates (utility)
 - ⇒ Buy down first cost
- Loop tariff programs (utility)
- Loop lease programs (utility or third-party provider)
- Low interest loan programs (utility or third-party provider)
 - ⇒ Decrease monthly payment, improve cash flow
- Direct sale of metered thermal energy (utility or third-party provider)
- Target replacement of heating technologies where there is a clear benefit in cost and CO₂ (electric, propane)
- Opportunities for third-party providers to partner with utilities to help achieve DSM goals



Thank you





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