DOE’s Proposed Furnace Rule:

An unnecessary challenge for Gas Utilities and their customers?

David C. Weaver
Vice President
Regulatory Affairs
July 2015
This Slide makes the lawyers happy!

Forward-Looking Statements

Certain expectations regarding in this presentation are forward-looking statements. Forward-looking statements involve matters that are not historical facts. Forward-looking statements contained in this press release include, without limitation, the expected use of proceeds of the senior note offerings. AGL Resources’ and AGL Capital's expectations are not guarantees and are based on currently available information. While these expectations are believed to be reasonable in view of the currently available information, they are subject to future events, risks and uncertainties, and there are several factors - many beyond the control of AGL Resources and AGL Capital - that could cause results to differ significantly from these expectations. These events, risks and uncertainties include the possibility that the conditions to closing the senior note offerings or the proposed merger with Nicor will not be satisfied or waived, and unforeseen events that may necessitate the application of the net proceeds of the senior note offerings to other, more critical purposes. Events, risks and uncertainties which may cause actual events to differ materially from expectations also include, but are not limited to, changes in price, supply and demand for natural gas and related products; the impact of changes in state and federal legislation and regulation including changes related to climate change; actions taken by government agencies on rates and other matters; concentration of credit risk; utility and energy industry consolidation; the impact on cost and timeliness of construction projects by government and other approvals, development project delays, adequacy of supply of diversified vendors, unexpected change in project costs, including the cost of funds to finance these projects; the impact of acquisitions and divestitures; direct or indirect effects on AGL Resources' business, financial condition or liquidity resulting from a change in credit ratings or the credit ratings of counterparties or competitors; interest rate fluctuations; financial market conditions, including recent disruptions in the capital markets and lending environment and the current economic downturn; general economic conditions; uncertainties about environmental issues and the related impact of such issues; the impact of changes in weather, including climate change, on the temperature-sensitive portions of AGL Resources' business; the impact of natural disasters such as hurricanes on the supply and price of natural gas; acts of war or terrorism; and other factors which are provided in detail in AGL Resources' filings with the Securities and Exchange Commission, which we incorporate by reference in this press release. Forward-looking statements are only as of the date they are made, and neither AGL Resources nor AGL Capital undertakes to update these statements to reflect subsequent changes.
DOE Furnace Rule: Good for Consumers?

- AGL supports energy efficiency programs and new R&D programs that would provide important appliance options for consumers
  - Since 2011, AGA member companies have cumulatively invested nearly $3.5 billion in efficiency programs
  - AGL Resources alone has worked with customers to save over 58 million therms over the past four years.

- The direct use of natural gas by consumers is a superior alternative in terms of cost, efficiency and environmental impact over:
  - Electricity generated by natural gas
  - Fuel Oil
  - Propane
DOE Furnace Rule: Sound energy policy?

### Natural Gas

**Source Energy**
- 100 MMBtu

**Extraction, Processing & Transportation**
- 7% Energy Loss
  - 93 MMBtu

**Generation**
- 1% Energy Loss
  - 92 MMBtu

**Delivered to Customer**
- 92 MMBtu

*No energy conversion necessary, therefore no energy is lost*

### Electricity

**Source Energy**
- 100 MMBtu

**Extraction, Processing & Transportation**
- 5% Energy Loss
  - 95 MMBtu

**Generation**
- 64% Energy Loss
  - 34 MMBtu

**Distribution**
- 6% Energy Loss
  - 32 MMBtu

**Delivered to Customer**
- 32 MMBtu

*Based on 2009 actual generation mix of all energy sources*
DOE Furnace Rule: Good for the Environment?

• Methane emissions from natural gas LDCs is not an issue that requires federal action
  • Through energy efficiency programs and pipe replacement programs, emissions have been reduced by 20% since the 1990s.
  • Emissions from LDCs account for less than 0.26% of total industry
  • Emissions will never be zero. Costs to move the performance toward 0.20% can be significant

• The EPA has agreed with ONE FUTURE to allow LDCs to continue with voluntary programs with no federal mandates.
DOE Furnace Rule: Unintended Consequence (?)

- DOE estimates the proposed rule would cost consumers an additional $6-$12 billion

- Not included is estimate:
  - The propose furnace rule will cost consumers an additional $2500 to vent condensing furnaces
  - Consumers may likely opt for lower upfront costs for less efficient electric heat
  - Moving away from gas appliances could result in 463,000 dekatherms of additional energy usage and $45 million in increased consumer costs annually
Concluding thoughts

• DOE needs to revisit the proposed rule
  • Start over with more transparency and more stakeholder input

• DOE’s claims to have justification to spend $3 billion annually on pipeline replacement programs and emissions monitoring
  • Are those “available” funds better suited for R&D on efficient gas appliances that are affordable for consumers?

• Furnace Rule + 2007 EISA Ban on Fossil fuels in federal buildings by 2030 = ?? [Anti Gas Bias?]
Thank you!

David C. Weaver
AGL Resources
dweaver@aglresources.com
LACLEDE IS A GAS COMPANY AT ITS CORE

- Three gas utilities with comparable service areas, customers and distribution systems
- Shared focus on safe and reliable service, community development and growth
- Financially strong and well-run with long operating histories
- Constructive working relationships with regulators
- Serves regions with solid market and economic profiles
- Strong track record promoting energy efficiency

![Gas Distribution Customers Chart]

- Missouri Gas Energy: 27%
- Lacelde Gas: 41%
- Alagasco: 32%
- Total: 1.56 Million Gas Distribution Customers
RESIDENTIAL FURNACE EFFICIENCY STANDARDS

The DOE’s Notice of Proposed Rulemaking:

1) Creates a national ban on non-condensing natural gas furnaces
   - Does so by administrative fiat, rather than compelling rationale or broad, popular support
   - Restricts consumer choices and creates significant additional replacement cost
     - Furnaces below 92% efficiency would be no longer available; traditional furnaces are generally 80% efficient by AFUE standards
     - Impacts related appliance choices, such as for water heaters
   - In direct conflict with the Direct Final Rule from just 3 years ago, which stated that it didn’t make sense to apply this broadly
     - Non-economic in the southern region
These changes could impose significant costs, driving homeowners away from natural gas to alternative fuel heating systems that could be ultimately less efficient and less cost effective.
LEGAL CHALLENGES

Legal infirmities identified by APGA

• DOE may not proceed on the basis of a Technical Support Document that has not been the subject of an updated peer review
  – Office of Management & Budget requires agencies to conduct independent peer reviews to ensure integrity of data and analysis used to establish federal policies and rules
  – Peer review relied upon by DOE was conducted over 8 years ago and did not assess critical components of current analysis underlying Proposed Rule
  – Fuel switching assumptions in current analysis is one example of a critical component that has not been peer reviewed

• DOE is precluded by the EPCA and its own Process Improvement Rule from adopting new standard until it has completed test procedures
  – Measures the energy efficiency, energy use and other operational attributes of products
  – DOE has arbitrary assumed, without support, that such testing is not necessary

• DOE proposed ban violates requirement for 10 and 6 year intervals
  – 10-year window between the compliance dates for the first and second rounds of rulemaking
  – 6-year window between compliance dates for new appliance standards in general (furnace fan rule goes into effect 2019)
  – Compliance date under either requirement should be 2025 for adopting and implementing new energy efficiency standards for non-weatherized gas furnaces
OTHER LEGAL ISSUES

U.S.C. § 2695(o)(2)(A)

• Any amended furnace standard must be designed to achieve the maximum improvement in energy efficiency which DOE determines is technologically feasible and economically justified.

U.S.C. § 6295(o)(2)(B)

• In determining whether a standard is economically justified, DOE must determine whether the benefits of the standard exceed its burdens by considering the following factors:
  1) the economic impact on manufacturers and consumers;
  2) the savings in operating costs throughout the product’s estimated average life;
  3) the total projected amount of energy saved;
  4) any lessening of the utility or performance of the product;
  5) the impact of any lessening of competition;
  6) the need for national energy and water conservation; and
  7) other factors the Secretary considers relevant.

U.S.C. § 6295(q)(1)

• EPCA requires DOE to establish separate product types or classes where the covered products consume different fuels or have a capacity or other performance-related features that justify a higher or lower standard from that for other product types or classes.
RESIDENTIAL FURNACE EFFICIENCY STANDARDS

The DOE’s Notice of Proposed Rulemaking:

1) Creates a national ban on non-condensing natural gas furnaces

2) Justification is based on questionable life-cycle cost (LCC) techniques
   - Relies upon dubious cost/benefit assumptions
   - Assumes furnace have a longer life than experience would show (over 20 years)
   - Lacks transparency that defies independent validation
   - Results in outcomes that defy free-market economics, and significantly different results from their own study from 2012
MARGINAL COST SAVINGS

It makes a difference: Fixed vs. Variable and Average vs. Marginal Costs

- Utility costs are almost entirely fixed, so marginal costs principally commodity-related
  - Utilities with SFV, decoupled, weather-normalized or similar this would be their rate structure
  - Lower usage would adjust rate determinants at next rate review, and distribution cost would be re-spread
- Utilization of various hub prices would be closer than a straight average of cost/MMBtu that ignores weighting for population and is inclusive of fixed distribution costs
  - A “commodity plus transport” (at 100% load factor) would reflect the appropriate marginal cost

<table>
<thead>
<tr>
<th></th>
<th>Marginal Winter Rate</th>
<th>Customers in 2013</th>
<th>% Total in MO</th>
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</thead>
<tbody>
<tr>
<td>Laclede Gas</td>
<td>$5.88</td>
<td>602,459</td>
<td>48.4%</td>
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<tr>
<td>MGE</td>
<td>$6.38</td>
<td>440,401</td>
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<tr>
<td>DOE</td>
<td>$11.38</td>
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DOE LCC Marginal Winter Rates in Missouri

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<th>$/MMBtu Bins</th>
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<tbody>
<tr>
<td>0</td>
<td>$6.50</td>
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<td>50</td>
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<td>100</td>
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<td>150</td>
<td>$9.50</td>
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<td>200</td>
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</tr>
<tr>
<td>400</td>
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<tr>
<td>More</td>
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<th>Feb</th>
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<th>Jul</th>
<th>Aug</th>
<th>Sep</th>
<th>Oct</th>
<th>Nov</th>
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<td>$239.93</td>
<td>$259.88</td>
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</table>
Unreasonable incremental costs

- Our survey showed condensing furnace costs are much higher
- Related costs underwhelmed
  - Low installation costs (did not contact installers)
  - Maintenance costs are essentially same as non-condensing furnaces

Results of high benefits, low costs and a longer life...

- ...are significantly different between previous and current study

GTI’s study showed a net negative average outcome

- 83% of the market is negative/neutral
- DOE shows 61% of the market have no impact, even with the biased assumptions
RESIDENTIAL FURNACE EFFICIENCY STANDARDS

The DOE’s Notice of Proposed Rulemaking:

1) Creates a national ban on non-condensing natural gas furnaces

2) Justification is based on questionable life-cycle cost (LCC) techniques

3) DOE’s proposal will move the market to higher levels of electrification
   – Rather than moving the market to higher levels of efficiency and lower carbon emissions, it would do just the opposite
   – Actual economics will drive many consumers to electric space and water heating – this is especially true in the South, which DOE even shows as non-beneficial for most customers
   – Site vs. Source:
     • Electric generation is based primarily on carbon-based fuels
     • Generation of one energy from another, and then distributed through hundreds of miles of transmission systems is inherently less efficient
     • Greater energy inefficiency results in more energy consumption, with resulting increased commodity costs and higher greenhouse gases
SITE VS SOURCE – LESS ENERGY EFFICIENT...

**Electricity**

<table>
<thead>
<tr>
<th>Source Energy</th>
<th>Extraction, Processing &amp; Transportation</th>
<th>Generation</th>
<th>Distribution</th>
<th>Delivered to Customer</th>
</tr>
</thead>
<tbody>
<tr>
<td>100 MMBtu</td>
<td>95 MMBtu</td>
<td>34 MMBtu</td>
<td>32 MMBtu</td>
<td>32 MMBtu</td>
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</table>

**Natural Gas**

<table>
<thead>
<tr>
<th>Source Energy</th>
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<td>100 MMBtu</td>
<td>93 MMBtu</td>
<td></td>
<td>92 MMBtu</td>
<td>92 MMBtu</td>
</tr>
</tbody>
</table>

Content from AGA
...AND MORE CARBON INTENSIVE

Electric Generation MWh by Fuel (%)

U.S. Total (2013)

EIA data
RESIDENTIAL FURNACE EFFICIENCY STANDARDS

The DOE’s Notice of Proposed Rulemaking:

1) Creates a national ban on non-condensing natural gas furnaces
2) Justification is based on questionable life-cycle cost (LCC) techniques
3) DOE’s proposal will move the market to higher levels of electrification
4) Such standards only make economic sense in higher-use applications
   - Predominantly in the northern U.S., but even there lower-use applications exist
     • Northern markets already moving to condensing furnaces without such rulemaking
     • Residential gas consumption has already achieved significant efficiencies on its own
   - Laclede is supportive of comments made by AGA and APGA and would ask that such proposal is withdrawn
     • Electric furnaces have no such restrictions, so why should gas?
GAS MARKET ALREADY ACHIEVING ENERGY EFFICIENCY

AHRI shows markets are already significantly moving in the direction of higher efficiency condensing furnaces, especially in North America.

What problem is being solved here?

Nearly a 25% decrease in 20 years in Average Residential Use/Customer

27% More Residential Gas Customers, But 1% Less Usage

EIA data
GTI Technical Analysis of DOE NOPR on Residential Furnace Minimum Efficiencies

2015 NARUC Summer Committee Meetings
July 14, 2015
Neil Leslie, Gas Technology Institute
(847) 768-0926, neil.leslie@gastechnology.org
GTI Overview
ESTABLISHED 1941

> Independent, not-for-profit established by the natural gas industry

> Providing natural gas research, development and technology deployment services to industry and government clients

> Performing contract research, program management, consulting, and training

> Wellhead to the burner tip including energy conversion technologies
**GTI’s Energy Utilization RD&D Program**

*Five Areas of Focus for Efficient, Clean Uses of Natural Gas*

<table>
<thead>
<tr>
<th>Highly Efficient Appliances (Including over 100% efficiency)</th>
<th>Highly Efficient Appliances (Including over 100% efficiency)</th>
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<tbody>
<tr>
<td>• Combination Space/Water Heating Systems</td>
<td><img src="image1.jpg" alt="Image" /></td>
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<tr>
<td>• Gas Heat Pumps (Space Conditioning, Water Heating)</td>
<td><img src="image2.jpg" alt="Image" /></td>
</tr>
<tr>
<td>• Ventilation, Indoor Air Quality</td>
<td><img src="image3.jpg" alt="Image" /></td>
</tr>
<tr>
<td>• Commercial Foodservice</td>
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<table>
<thead>
<tr>
<th>Efficient, Clean Industrial Processes</th>
<th>Efficient, Clean Industrial Processes</th>
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<tbody>
<tr>
<td>• Efficient, low NOx Boilers</td>
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<tr>
<td>• Advanced Process Heating</td>
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<tr>
<td>• Heat Recovery Systems</td>
<td><img src="image7.jpg" alt="Image" /></td>
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<tr>
<td>• Process Controls and Sensors</td>
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<tr>
<th>Combined Heat &amp; Power</th>
<th>Combined Heat &amp; Power</th>
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<tr>
<td>• Integrated Commercial/Industrial CHP Systems</td>
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<tr>
<td>• Micro CHP Systems</td>
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<th>NGVs, Hydrogen, and Alternative Vehicles</th>
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<tbody>
<tr>
<td>• Ultra-Clean, Efficient HD NGVs and NGV Storage</td>
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<tr>
<td>• NGV Fuel Stations, Home Fueling</td>
<td><img src="image12.jpg" alt="Image" /></td>
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<tr>
<td>• Hydrogen Fuel Cells, H₂ Fueling</td>
<td><img src="image13.jpg" alt="Image" /></td>
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<tr>
<th>Renewable Energy</th>
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<tr>
<td>• Solar Thermal/Natural Gas Hybrid Systems</td>
<td><img src="image14.jpg" alt="Image" /></td>
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<tr>
<td>• Bio-Methane Production, Clean-Up, and Use</td>
<td><img src="image15.jpg" alt="Image" /></td>
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</table>
Residential Energy Use
The Big Picture

Residential energy use and losses impacted by growing electricity use between 1980 and 2010

U.S. Residential Electricity and Natural Gas Use
Site Use and Pre-Meter Losses, Quads
Source: DOE-EIA, 2013 data

- Electric site, 4.77, 24%
- Electric Losses, 9.59, 49%
- Natural Gas losses, 0.46, 2%
- Natural Gas site, 4.94, 25%
Expanding Residential Electricity Use (1980-2010)
Includes Thermal Loads

RESIDENTIAL SPACE HEATING

RESIDENTIAL WATER HEATING

Number of Heating Units (Millions)

- Natural Gas
- Electricity

1980
2009
DOE Residential Furnace Efficiency Proposed Rulemaking

> DOE published a proposed furnace efficiency standard on 3/12/15; public comment period ended 7/10/15.
  > 92% AFUE (condensing furnace) national standard, effective 5 years after final rule is published
  > Fuel switching impacts considered for the first time

> Gas industry concerns with technical justification for NOPR based on previous analysis
  > Inconsistent with market-based data
  > Need to understand fuel switching analysis methodology compared to 2014 fuel switching survey
LCC/Crystal Ball Spreadsheet Analysis – GTI Areas of Focus

> Detailed examination of DOE NOPR LCC Model
  – Approach, assumptions, and results
  – LCC analysis spreadsheet and Crystal Ball model
  – Rational Consumer Economic Decision (CED) framework and methodology developed by GTI
  – Surveys (e.g., American Home Comfort Study) and data on targeted input variables
  – Consumer benefits and costs associated with trial standard levels of furnace efficiency

> National impact comparison between DOE NOPR and scenario developed by GTI
Summary of GTI Analysis Results

> The examination identified flaws in two key areas
  — Random decision making methodology used by DOE to assign the base case furnace and fuel switching prompted by the proposed rule
  — Outdated or incorrect market data used for key input variables in the model/spreadsheets

> DOE NOPR LCC model results overstate savings compared to CED framework
Lifecycle Cost and Market Impacts

> GTI Scenario Int-5
  - Negative average LCC savings
  - More consumers with net cost than net benefit
  - Increased total primary energy use and CO$_2$e emissions resulting from the proposed rule

> Negative societal impacts of fuel switching caused by DOE rule outweigh the natural gas primary energy savings and associated CO$_2$e emission reduction

<table>
<thead>
<tr>
<th>LCC Model</th>
<th>Average Furnace Life-cycle Cost (LCC) Savings</th>
<th>Fraction of Furnace Population (%)</th>
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</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Net Cost</td>
</tr>
<tr>
<td>DOE NOPR LCC Model</td>
<td>$305</td>
<td>20%</td>
</tr>
<tr>
<td>GTI Integrated Scenario Int-5</td>
<td>-$181</td>
<td>27%</td>
</tr>
</tbody>
</table>
National Impact Estimate

GTI Scenario Int-5

30-Year National Impact of Increased Natural Gas Furnace Efficiency
- 18.1 million homes
- 1.85 Quads Primary Energy Savings
- 123 Million Metric Tonne Decrease in CO₂-eq Emissions

30-Year National Impact of Natural Gas to Electricity Fuel Switching
- 5.28 million homes
- 2.33 Quads Higher Primary Energy Use
- 145.3 Million Metric Tonne Increase in CO₂-eq Emissions

10,000 Furnaces
- 283 Commercial Units
- 9,717 Homes
- Impacted 4,226 Homes (43.5%)
- Continued Gas Use 3,272 Homes (77.4%)
- Fuel Switch to Electric Options 954 Homes (22.6%)
- Not Impacted 5,491 Homes (56.5%)

Electric Heat Pumps 589 Homes (61.7%)
Electric Resistance Devices 365 Homes (38.3%)
Summary

> DOE LCC analysis contains significant technical flaws that overstate savings compared to CED framework

> CED framework addresses decision making flaws using detailed AHCS information

> Improved input data addresses inconsistency between DOE calculations and market data

> Integrated CED and Data scenario shows no economic justification for a DOE proposed rule at any of the TSLs (90, 92, 95, or 98% AFUE) evaluated by DOE

> National impact estimate shows increased primary energy and CO$_2$e emissions caused by rule
Supplemental Information
Four Categories of Consumers Based on Financial Benefit or Loss

> **Category 1:** Consumers that choose a condensing furnace, and accrue financial benefit

> **Category 2:** Consumers that choose a condensing furnace, but suffer financial loss

> **Category 3:** Consumers that do not choose a condensing furnace, and do not accrue financial benefit

> **Category 4:** Consumers that do not choose a condensing furnace, and do not suffer financial loss
# Consumer Economic Decision Framework

| Consumer Economic Decision Making Based on Unregulated Market Factors, Market Transformations, and Regulatory Interventions |
|---|---|---|
| **Unregulated Market (Based on Economic Factors)** | **Financial Benefit (Acceptable Payback)** | **Financial Loss (Unacceptable Payback)** |
| **Select Condensing Furnace** (48.5% of purchases in 2014). | **Category 1** Rational decision. | **Category 2** Irrational decision. |
| **Do Not Select Condensing Furnace** (51.5% of purchases in 2014). | **Category 3** Irrational decision. | **Category 4** Rational decision. |
| **Market Transformation (Energy Efficiency Incentives)** | **Financial Benefit (Acceptable Payback or LCC)** | **Financial Loss (Unacceptable Payback or LCC)** |
| **Select Condensing Furnace.** | Rational decision. Incentives may induce Category 3 or Category 4 consumers to make rational decision. May also have Category 1 free riders. | Irrational decision. Incentives may induce Category 4 consumers to make irrational decision. May also have Category 2 free riders. |
| **Do Not Select Condensing Furnace.** | Irrational decision. Incentives do not induce Category 3 consumers to make rational decision. | Rational decision. Incentives do not induce Category 4 consumers to make irrational decision. |
| **Regulatory Intervention (Codes, DOE Rule, Legislation)** | **Financial Benefit (Acceptable LCC)** | **Financial Loss (Unacceptable LCC)** |
| **Select Condensing Furnace.** | Intervention does not impact Category 1 consumers. May force Category 3 consumers to make rational decision. | Intervention does not impact Category 2 consumers. May force Category 4 consumers to make irrational decision. |
| **Do Not Select Condensing Furnace.** | May force Category 3 consumers to fuel switch. | May force Category 4 consumers to fuel switch. |
Technical Flaws in DOE’s Decision Making Criteria

> Random baseline furnace assignment
  ─ Ignores consumer economic decision making
  ─ Causes wrong consumers to be impacted by rule
  ─ Overstates savings compared to CED framework

> Average “switching payback” period for fuel switching decisions
  ─ Consumer response to LCC savings is non-linear; averaging overstates savings
  ─ Distribution of allowable “switching payback” periods based on income; averaging overstates savings
## Illustrative DOE “Impacted by Rule” Cases With First Cost and Operating Cost Savings

<table>
<thead>
<tr>
<th>Crystal Ball Trial Case</th>
<th>92% vs. 80%</th>
<th>LCC Savings</th>
<th>Region/Location</th>
<th>Type</th>
<th>Payback (Years)</th>
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<td>$315</td>
<td>$8,659</td>
<td>No Impact</td>
<td>North/ New York</td>
</tr>
<tr>
<td>1886</td>
<td>-$690</td>
<td>$360</td>
<td>$6,961</td>
<td>No Impact</td>
<td>North/ New York</td>
</tr>
<tr>
<td>138</td>
<td>-$856</td>
<td>$56</td>
<td>$2,165</td>
<td>No Impact</td>
<td>South/ AL, KY, MS</td>
</tr>
<tr>
<td>5327</td>
<td>-$741</td>
<td>$379</td>
<td>$6,917</td>
<td>No Impact</td>
<td>North/ Pacific</td>
</tr>
<tr>
<td>8042</td>
<td>-$876</td>
<td>$155</td>
<td>$5,934</td>
<td>No Impact</td>
<td>South/ Tennessee</td>
</tr>
</tbody>
</table>
## Illustrative DOE “No Impact” Cases With Negative LCC Savings

<table>
<thead>
<tr>
<th>Crystal Ball Trial Case</th>
<th>92% vs. 80%</th>
<th>LCC Savings</th>
<th>Region/Location</th>
<th>Type</th>
<th>Payback (Years)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Cost Penalty</td>
<td>Annual Savings</td>
<td>DOE</td>
<td>GTI Scenarios</td>
<td></td>
</tr>
<tr>
<td>287</td>
<td>$1,055</td>
<td>$1</td>
<td>No Impact</td>
<td>No Impact</td>
<td>North/IA, MN, ND, SD</td>
</tr>
<tr>
<td>5872</td>
<td>$1,118</td>
<td>$3</td>
<td>No Impact</td>
<td>-$809</td>
<td>North/IN, OH</td>
</tr>
<tr>
<td>8906</td>
<td>$810</td>
<td>$2</td>
<td>No Impact</td>
<td>-$59</td>
<td>North/OR, WA</td>
</tr>
<tr>
<td>6467</td>
<td>$4,620</td>
<td>$23</td>
<td>No Impact</td>
<td>-$3,792</td>
<td>North/Illinois</td>
</tr>
<tr>
<td>8377</td>
<td>$3,287</td>
<td>$27</td>
<td>No Impact</td>
<td>-$3,035</td>
<td>South/California</td>
</tr>
<tr>
<td>7147</td>
<td>$1,891</td>
<td>$10</td>
<td>No Impact</td>
<td>-$1,680</td>
<td>South/California</td>
</tr>
</tbody>
</table>
## Impact of DOE Random Base Case Assignment

<table>
<thead>
<tr>
<th>Characteristics of Crystal Ball Trial Cases at 92% TSL</th>
<th>DOE LCC Model</th>
<th>GTI Scenarios</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Number of Cases</td>
<td>Percent of Total</td>
</tr>
<tr>
<td>Number of Residential</td>
<td>9,717</td>
<td>100%</td>
</tr>
<tr>
<td>Replacements</td>
<td>7,241</td>
<td>75%</td>
</tr>
<tr>
<td>- Payback Period ≤ 0 years</td>
<td>530</td>
<td>5%</td>
</tr>
<tr>
<td>- Impacted by Rule</td>
<td>324</td>
<td>3%</td>
</tr>
<tr>
<td>- Payback Period &gt;15 years</td>
<td>3,062</td>
<td>32%</td>
</tr>
<tr>
<td>- No Impact</td>
<td>1,053</td>
<td>11%</td>
</tr>
<tr>
<td>New Installations</td>
<td>2,476</td>
<td>25%</td>
</tr>
<tr>
<td>- Payback Period ≤ 0 years</td>
<td>1,709</td>
<td>18%</td>
</tr>
<tr>
<td>- Impacted by Rule</td>
<td>1,061</td>
<td>11%</td>
</tr>
<tr>
<td>- Payback Period &gt;15 years</td>
<td>21</td>
<td>0%</td>
</tr>
<tr>
<td>- No Impact</td>
<td>7</td>
<td>0%</td>
</tr>
<tr>
<td>Total Residential Trial Cases</td>
<td>9,717</td>
<td>100%</td>
</tr>
<tr>
<td>- Payback Period ≤ 0 years</td>
<td>2,239</td>
<td>23%</td>
</tr>
<tr>
<td>- Impacted by Rule</td>
<td>1,385</td>
<td>14%</td>
</tr>
<tr>
<td>- Payback Period &gt;15 years</td>
<td>3,083</td>
<td>32%</td>
</tr>
<tr>
<td>- No Impact</td>
<td>1,060</td>
<td>11%</td>
</tr>
</tbody>
</table>
Technical Flaws in DOE’s Input Data Assumptions

> DOE information is inaccurate or outdated
  – AEO 2014 forecast
  – Extrapolated condensing furnace fractions
  – Component build-up for manufacturing costs
  – Marginal gas prices using adjusted average prices

> Each assumption overstates savings compared to more accurate and current data
Approach to Correct DOE Methodology Flaws

> Consumer Economic Decision framework for baseline furnace assignment
  > Different consumers impacted by DOE rule
  > Fewer new installations impacted by DOE rule
  > More replacements impacted by DOE rule

> More granular AHCS survey information for full distribution of consumer allowable payback
  > Different consumers impacted by DOE rule
  > Different consumers induced to fuel switch; more inefficient fuel switching by impacted consumers compared to DOE NOPR methodology
Approach to Correct DOE Input Data Flaws

> AEO 2015 forecast
  — Impact: Lower energy price trends than AEO 2014

> AHRI condensing furnace shipment data
  — Impact: Higher condensing furnace fractions

> Internet direct-to-consumer furnace price data
  — Impact: Higher differential price between condensing furnace and non-condensing furnace in 2013 Internet direct-to-consumer price guide

> AGA marginal natural gas prices using tariff data
  — Impact: Lower marginal gas prices in AGA tariff data
Trend Line based on updated AHRI Shipment Data for 2010 – 2014

- Trend Lines with AHRI Shipments
- DOE NOPR Trend Lines
- 2021 First Year Rule Is in Effect
- 2003 Last Year of State Level Shipment Data from AHRI
- 2006 – 2011 Tax Rebates in Effect
- EPA Energy Star Shipment Data Used by DOE for 2010 – 2012
Integrated Scenario Selection Criteria

> Use consumer economic decision framework with AHCS payback distribution by income for baseline furnace assignment and LCC analysis
  ─ Calibrate minimum allowable payback period to align with DOE fuel switching fractions
    > Scenario 24 aligns better than Scenario 23
  ─ Incorporate improved input data (Scenario I-16)
    > AEO 2015 forecast, AHRI condensing furnace shipment data, 2013 furnace price guide data, AGA marginal gas prices using actual tariffs

> Integrate Scenarios 24 and I-16 for final result (Scenario Int-5)
# Summary of National Results: DOE LCC Model vs. GTI Scenario Int-5

## DOE NOPR LCC Model (GTI Scenario 0)

<table>
<thead>
<tr>
<th>Level</th>
<th>Description</th>
<th>Installed Price</th>
<th>Lifetime Oper. Cost*</th>
<th>LCC Savings</th>
<th>Net Cost</th>
<th>No Impact</th>
<th>Net Benefit</th>
<th>Average</th>
<th>Median</th>
</tr>
</thead>
<tbody>
<tr>
<td>NWGF</td>
<td>0 NWGF 80%</td>
<td>$2,218</td>
<td>$10,314</td>
<td>$12,533</td>
<td>22%</td>
<td>47%</td>
<td>32%</td>
<td>18.0</td>
<td>10.6</td>
</tr>
<tr>
<td></td>
<td>1 NWGF 90%</td>
<td>$2,654</td>
<td>$9,388</td>
<td>$12,042</td>
<td>22%</td>
<td>47%</td>
<td>32%</td>
<td>18.0</td>
<td>10.6</td>
</tr>
<tr>
<td></td>
<td>2 NWGF 92%</td>
<td>$2,669</td>
<td>$9,228</td>
<td>$11,897</td>
<td>20%</td>
<td>41%</td>
<td>39%</td>
<td>13.9</td>
<td>7.7</td>
</tr>
<tr>
<td></td>
<td>3 NWGF 95%</td>
<td>$2,788</td>
<td>$8,985</td>
<td>$11,773</td>
<td>24%</td>
<td>23%</td>
<td>53%</td>
<td>12.9</td>
<td>8.9</td>
</tr>
<tr>
<td></td>
<td>4 NWGF 98%</td>
<td>$2,948</td>
<td>$8,771</td>
<td>$11,718</td>
<td>40%</td>
<td>0%</td>
<td>60%</td>
<td>16.8</td>
<td>12.0</td>
</tr>
</tbody>
</table>

## Scenario Int 5 (Scenarios 24 & I-16) (D2, D4, D5, D8 D9, I2, I6, I8, I13)

<table>
<thead>
<tr>
<th>Level</th>
<th>Description</th>
<th>Installed Price</th>
<th>Lifetime Oper. Cost*</th>
<th>LCC Savings</th>
<th>Net Cost</th>
<th>No Impact</th>
<th>Net Benefit</th>
<th>Average</th>
<th>Median</th>
</tr>
</thead>
<tbody>
<tr>
<td>NWGF</td>
<td>0 NWGF 80%</td>
<td>$2,016</td>
<td>$9,984</td>
<td>$12,001</td>
<td>28%</td>
<td>62%</td>
<td>10%</td>
<td>39.2</td>
<td>28.0</td>
</tr>
<tr>
<td></td>
<td>1 NWGF 90%</td>
<td>$2,634</td>
<td>$9,266</td>
<td>$11,900</td>
<td>28%</td>
<td>62%</td>
<td>10%</td>
<td>39.2</td>
<td>28.0</td>
</tr>
<tr>
<td></td>
<td>2 NWGF 92%</td>
<td>$2,649</td>
<td>$9,123</td>
<td>$11,772</td>
<td>27%</td>
<td>57%</td>
<td>17%</td>
<td>28.0</td>
<td>19.8</td>
</tr>
<tr>
<td></td>
<td>3 NWGF 95%</td>
<td>$3,139</td>
<td>$9,017</td>
<td>$12,156</td>
<td>57%</td>
<td>29%</td>
<td>14%</td>
<td>40.4</td>
<td>32.5</td>
</tr>
<tr>
<td></td>
<td>4 NWGF 98%</td>
<td>$3,283</td>
<td>$8,882</td>
<td>$12,165</td>
<td>68%</td>
<td>2%</td>
<td>30%</td>
<td>30.8</td>
<td>24.6</td>
</tr>
</tbody>
</table>
# Low Income Results: DOE LCC Model vs. GTI Scenario Int-5

## Simulation Results Low Income Only

<table>
<thead>
<tr>
<th>Level</th>
<th>Description</th>
<th>Installed Price</th>
<th>Lifetime Oper. Cost*</th>
<th>LCC</th>
<th>Savings</th>
<th>Net Cost</th>
<th>No Impact</th>
<th>Net Benefit</th>
<th>Average</th>
<th>Median</th>
</tr>
</thead>
<tbody>
<tr>
<td>NWGF</td>
<td>0 NWGF 80%</td>
<td>$1,983</td>
<td>$10,641</td>
<td>$12,625</td>
<td>$176</td>
<td>26%</td>
<td>43%</td>
<td>31%</td>
<td>19.6</td>
<td>12.8</td>
</tr>
<tr>
<td></td>
<td>1 NWGF 90%</td>
<td>$2,498</td>
<td>$9,720</td>
<td>$12,218</td>
<td>$247</td>
<td>23%</td>
<td>38%</td>
<td>39%</td>
<td>16.2</td>
<td>10.0</td>
</tr>
<tr>
<td></td>
<td>2 NWGF 92%</td>
<td>$2,512</td>
<td>$9,562</td>
<td>$12,074</td>
<td>$330</td>
<td>26%</td>
<td>24%</td>
<td>51%</td>
<td>13.1</td>
<td>9.5</td>
</tr>
<tr>
<td></td>
<td>3 NWGF 95%</td>
<td>$2,618</td>
<td>$9,328</td>
<td>$11,945</td>
<td>$485</td>
<td>43%</td>
<td>1%</td>
<td>56%</td>
<td>17.4</td>
<td>12.7</td>
</tr>
<tr>
<td></td>
<td>4 NWGF 98%</td>
<td>$2,776</td>
<td>$9,012</td>
<td>$11,789</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

## Simulation Results Low Income Only

<table>
<thead>
<tr>
<th>Level</th>
<th>Description</th>
<th>Installed Price</th>
<th>Lifetime Oper. Cost*</th>
<th>LCC</th>
<th>Savings</th>
<th>Net Cost</th>
<th>No Impact</th>
<th>Net Benefit</th>
<th>Average</th>
<th>Median</th>
</tr>
</thead>
<tbody>
<tr>
<td>NWGF</td>
<td>0 NWGF 80%</td>
<td>$1,771</td>
<td>$10,201</td>
<td>$11,972</td>
<td></td>
<td>31%</td>
<td>61%</td>
<td>8%</td>
<td>39.1</td>
<td>28.1</td>
</tr>
<tr>
<td></td>
<td>1 NWGF 90%</td>
<td>$2,413</td>
<td>$9,873</td>
<td>$12,286</td>
<td>-$555</td>
<td>30%</td>
<td>56%</td>
<td>14%</td>
<td>29.0</td>
<td>21.1</td>
</tr>
<tr>
<td></td>
<td>2 NWGF 92%</td>
<td>$2,427</td>
<td>$9,737</td>
<td>$12,164</td>
<td>-$533</td>
<td>51%</td>
<td>36%</td>
<td>13%</td>
<td>36.6</td>
<td>30.1</td>
</tr>
<tr>
<td></td>
<td>3 NWGF 95%</td>
<td>$2,795</td>
<td>$9,743</td>
<td>$12,538</td>
<td>-$804</td>
<td>69%</td>
<td>2%</td>
<td>28%</td>
<td>31.5</td>
<td>25.1</td>
</tr>
<tr>
<td></td>
<td>4 NWGF 98%</td>
<td>$2,933</td>
<td>$9,575</td>
<td>$12,507</td>
<td>-$743</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>