Net Emissions Analysis Tool (NEAT) Working Group

Formally the Residential Commercial Appliance Life Cycle Analysis Working Group

Meeting #6
January 16th, 2019
Development Status Update

Sang-Mi Lee, Ph.D.
Planning and Rules Division
Working Group Meetings and Comment Letters to Date

• Six working group meetings (including today) and eight comment letters

• Working group meetings
  • Meeting #1 August 30, 2017
  • Meeting #2 November 16, 2017
  • Meeting #3 January 31, 2018
  • Meeting #4 April 18, 2018
  • Meeting #5 September 28, 2018
  • Meeting #6 January 16, 2019

• Comment Letters
  • Sierra Club – Nov. 2017
  • PSE Healthy Energy – Feb. 2018
  • Sustainable Analysis, LLC – Feb. 2018
  • SoCalGas – Mar. 2018
  • Sierra Club – Apr. 2018
  • Tim Kabat – Apr. 2018
  • SoCalGas – Jun. 2018
  • Sierra Club – Sep. 2018
Development Progress

• Meeting #1 August 30, 2017
  • Initiative to develop a tool to estimate cost effectiveness of emission reductions in residential sector
  • Solar Technology Initiative

• Meeting #2 November 16, 2017
  • Demand segment
  • Solar PV calculator
  • Collecting input data

• Meeting #3 January 31, 2018
  • Electric rate calculator
  • Net metering
  • Emissions from electricity generation
Development Progress (continued)

• Meeting #4 April 18, 2018
  • Natural gas rate calculator
  • Fugitive methane emissions from natural gas use
  • Continued discussions on emissions from electricity generation

• Meeting #5 September 28, 2018
  • Battery storage module
  • Electricity transmission and distribution loss
  • Renewable natural gas
  • Lifecycle Emissions from Gasoline and Diesel
Development Progress (continued)

• Meeting #6 January 16, 2019
  • Implementation of Battery Storage Module
  • Residential Rooftop Photovoltaic Cost Calculation
  • Live Demonstration of NEAT
Comments and Responses
(since last meeting)

Scott A. Epstein Ph.D. & Marc Carreras Sospedra Ph.D.
Planning and Rules Division
All comment letters posted to the NEAT website

- www.aqmd.gov/NEAT

No comment letters were submitted since last meeting, but we will discuss comments provided during last meeting.
Comments and Responses

• Utility-Specific Electricity Transmission and Distribution Loss
  • Use utility-specific loss rates from EIA-861 schedule 2 for all utilities in database
  • We added an option in the tool to use utility-specific loss rates from EIA-861
  • Loss rates are calculated as (total energy losses)/(total disposition)
  • Data from 2008 to 2017 was used for each utility
  • See https://www.eia.gov/electricity/data/eia861/ for details
  • Users have the choice to use flat loss rate across all utilities, use hourly loss rate for all utilities, or use utility-specific loss rate
### Utility-Specific Electricity Transmission and Distribution Loss

<table>
<thead>
<tr>
<th>UTILITY NAME</th>
<th>Years Available</th>
<th>Mean Loss Percentage</th>
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<tbody>
<tr>
<td>Azusa Light &amp; Power</td>
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<td>2.5</td>
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<tr>
<td>Bear Valley Electric Service</td>
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<td>12.2</td>
</tr>
<tr>
<td>Burbank Water &amp; Power</td>
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<td>3.5</td>
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<tr>
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<tr>
<td>City of Banning Electric Department</td>
<td>10</td>
<td>6.8</td>
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<tr>
<td>City of Corona Department of Water &amp; Power</td>
<td>10</td>
<td>2.7</td>
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<tr>
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<td>5.4</td>
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<tr>
<td>City of Vernon Municipal Light Department</td>
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<td>3.9</td>
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<tr>
<td>Glendale Water &amp; Power</td>
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<td>2.7</td>
</tr>
<tr>
<td>Los Angeles Department of Water &amp; Power</td>
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<td>9</td>
</tr>
<tr>
<td>Moreno Valley Utility</td>
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<td>5.5</td>
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<tr>
<td>Pasadena Water &amp; Power</td>
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<td>Rancho Cucamonga Municipal Utility</td>
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<td>2.9</td>
</tr>
<tr>
<td>San Diego Gas &amp; Electric</td>
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<td>4.3</td>
</tr>
<tr>
<td>Southern California Edison</td>
<td>10</td>
<td>5.2</td>
</tr>
</tbody>
</table>
Comments and Responses (continued)

• Thermal Storage Heat Pump Water Heaters
  • Include thermal storage heat pump water heater profiles in NEAT
  • *We included two additional electric profiles for electric water heating with basic strategies to shift electric load*
Electric Thermal Storage Water Heating

• Electric thermal storage water heating is an option to manage residential electrical load:
  • For peak shaving
  • For shifting demand to cheaper electricity rates
• Options include:
  • Electric resistance water heater (ERWH)
  • Heat pump water heater (HPWH)

http://thesunriseguide.com
Electric Thermal Storage Water Heating

• We implemented two basic thermal cycles that are based on the default water heating profile:
  • Fixed profile: water heating is turned off in the evening hours (5pm to 8pm)
  • Flex profile: water heating is turned off when the hourly electrical load is at the top 25% of a given day

• Overall electricity use is calculated using the Unit of Energy Consumption (UEC) that is specific to a given technology (ERWH, HPWH)
Comments and Responses (continued)

• EV Charging Profiles
  • Add additional EV charging profiles to NEAT
  • *We included two basic charging profiles for electric vehicles which correspond to Level 1 and Level 2 home EV chargers*
EV Charging Profiles

• We assumed that EV charging follows the strategy Constant Current/Constant Voltage (CC/CV) charging profile
• Vehicles are charged in the evening after 8 pm
• We included 2 charging profiles that represent Level 1 (~1.4 kW) and Level 2 (~5 kW) charging

EV Charging Profiles

• Duration of charging cycle depends on the charger level:
  • Level 1: 8 pm to 6 am
  • Level 2: 8 pm to 11 pm

• Charging cycle is assumed to be the same throughout the year
Implementation of Residential Battery Modeling in NEAT

Seungbum Ha Ph.D.
Technology Advancement Office
Summary of Previous Work

- Battery model has been developed
- Parameters for the model, test results from EV batteries, has been extracted from database provided by Argon National Laboratory
- Simple charging/discharging has been tested in the model
Integration of NEAT specific data into Model

- Required power (Power_solar – Power_elec use) changes every hour.

The model
- Parameterizes battery with charging-discharging behavior from datasheets (experimental results)
- Calculates voltage profile as a function of SOC and input current (power)

- Voltage-SOC profile varies for input current (power)

Excessive power from Solar panel
Power from grid or battery
Integration of NEAT specific data into Model - Continued

- Given the load and PV profile, the model calculates voltage and SOC change for every time step.
- Upper and lower charging/discharging rate limit is applied based on battery characteristics.
- The battery is programmed to discharge (charge) before reaching the minimum (maximum) SOC.

Computation by battery model
Integration of NEAT specific data into Model - Continued

Tesla powerwall 1

- Stop charging due to upper limit of SOC
- Stop discharging due to lower limit of SOC
- Use grid power
Integration of NEAT specific data into Model
- Continued

Tesla powerwall 2

- 2x battery capacity
- Battery profile doesn’t reach lower limit of SOC → minimizing use of grid power
Implementation of Battery model into NEAT

- Calculation algorithm needs to be optimized to implement into NEAT
- Adoptive charging/discharging control is required to develop

- Charging/discharging strategy varies by battery characteristics, solar production profile, electricity use profile and Tier rates.
- According to the strategy, electricity cost can be minimized.

- Enough solar production
- Relatively small and stable electricity use

Grid power is rarely used
Summary and Next steps

• Where we are
  • Battery model is tested using NEAT specific data
  • Two different types of residential batteries are simulated and charging/discharging profile is calculated.

• What needs to be done next
  • Battery model will be implemented into NEAT
    - optimizing algorithm
    - adopting improved charging/discharging strategy
  • Various scenarios will be tested.
    - Solar production, electricity use profile, battery size, tier rate
NEAT Demonstration

Scott A. Epstein Ph.D.
Planning and Rules Division
NEAT will still undergo extensive QA/QC from SCAQMD staff, the workgroup and other beta testers. Do not draw conclusions from demonstration results. Numbers are not final.
All results are preliminary and may change significantly after extensive QA/QC is conducted.
NEAT Starts in “Demand” Section

All results are preliminary and may change significantly after extensive QA/QC is conducted.
Ability to Load Entire Setup of Run or Results
NEAT Starts in “Demand” Section

All results are preliminary and may change significantly after extensive QA/QC is conducted.
NEAT Starts in “Demand” Section

All results are preliminary and may change significantly after extensive QA/QC is conducted.
Simple Example: Electrify Hot Water Heating and Add Rooftop PV for Single-Family Homes

All results are preliminary and may change significantly after extensive QA/QC is conducted.
Select Single Family Homes

All results are preliminary and may change significantly after extensive QA/QC is conducted.
Implement Hot Water Heating Change

All results are preliminary and may change significantly after extensive QA/QC is conducted.
View Hot Water Heating Profiles (leave unchanged)
All results are preliminary and should be subject to extensive QA/QC before interpreting.
**Ability to Add Technologies** *(leave unchanged)*

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**BASLINE TECHNOLOGY MIX PARAMETERS**

<table>
<thead>
<tr>
<th>Fuel Technology</th>
<th>UEC</th>
<th>NOx EF</th>
<th>CO2e EF</th>
<th>Unit Cost</th>
<th>Install Cost</th>
<th>Lifetime</th>
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<td>0</td>
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**NEW TECHNOLOGY PARAMETERS**

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</table>

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*All results are preliminary and should be subject to extensive QA/QC before interpreting.*

---
Ability to Assign Fuel, Profile, and Parameters to New Technology (leave unchanged)

All results are preliminary and should be subject to extensive QA/QC before interpreting.
All results are preliminary and should be subject to extensive QA/QC before interpreting.
Modify Methane Emissions from Natural Gas (leave unchanged)

All results are preliminary and should be subject to extensive QA/QC before interpreting.
Modify Renewable/Fossil Natural Gas Mixture (leave unchanged)

All results are preliminary and should be subject to extensive QA/QC before interpreting.
Modify Well-to-Pump Emissions of Transportation (leave unchanged)

All results are preliminary and should be subject to extensive QA/QC before interpreting.
Modify Electricity Generation from Grid (leave unchanged)

All results are preliminary and should be subject to extensive QA/QC before interpreting.
Modify Elec. Transmission and Distribution Loss (leave unchanged)
Implement Rooftop Solar PV

*All results are preliminary and should be subject to extensive QA/QC before interpreting.*
Implement Residential Battery Storage (leave unchanged)

All results are preliminary and should be subject to extensive QA/QC before interpreting.
Economics Tab (leave unchanged)
Economics Tab (leave unchanged)

Green light indicates that Values are loaded
Economics Tab (leave unchanged)
View/Edit Low Income Fractions (leave unchanged)
### View/Edit Low Income Fractions (leave unchanged)

Values below represent the percentage of homes in each electric/gas utility combination, climate zone, and housing category that are eligible for low income rates. Default values are estimated with a comprehensive analysis of IPUMS harmonized American Community Survey data from 2016, the most current year on record. Household income, units in structure, Public Use Microdata Area (cross-referenced to climate zone), residents in household, age of residents, public health insurance coverage, venture income, food stamp recipients, disability status, and veteran status are extracted. Residents living in group quarters were removed. The qualification criteria for low income rates for each utility was then identified and cross-referenced with the IPUMS data to determine the fraction of households in each climate zone and housing category that are eligible for the low income rates. In utilities with both California Alternate Rates for Energy (CARE) and Family Electric Rate Assistance (FERA), only CARE rates are utilized. Some utilities have low income rates that are a flat subsidy. These utilities are ignored in the low income rate analysis because NEAT performs a difference analysis and flat subsidy benefits cancel out when calculating the utility bill difference between the selected scenario case and the base case. The utilities without a low income rate or with flat subsidies for low income residents appropriate all residents into the "high income" designation for this analysis. The values that are currently stored in memory are initially loaded. Use the "Load Default Values" button to re-populate the table with the default values and then use the "Save as File" button to store the default values in memory. Any edits to the table must also be stored with the "Save as File" button.

<table>
<thead>
<tr>
<th>Rate Selector</th>
<th>Analysis</th>
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**Single Family Homes [%]**

<table>
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<tr>
<th>Rate Type</th>
<th>Electric Utility</th>
<th>Rate Type</th>
<th>Gas Utility</th>
<th>C.Z. 8</th>
<th>C.Z. 9</th>
<th>C.Z. 10</th>
<th>C.Z. 12</th>
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<td>100</td>
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**Multi Family Homes [%]**

<table>
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<th>Rate Type</th>
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<th>Rate Type</th>
<th>Gas Utility</th>
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<th>C.Z. 9</th>
<th>C.Z. 10</th>
<th>C.Z. 12</th>
<th>C.Z. 14</th>
<th>C.Z. 16</th>
</tr>
</thead>
<tbody>
<tr>
<td>High</td>
<td></td>
<td>High</td>
<td>CITY OF VERNON GAS SYSTEM</td>
<td>100</td>
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</tr>
<tr>
<td>Low</td>
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<td>Low</td>
<td>CITY OF VERNON GAS SYSTEM</td>
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</tbody>
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**Mobile Homes [%]**

<table>
<thead>
<tr>
<th>Rate Type</th>
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<th>Rate Type</th>
<th>Gas Utility</th>
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<th>C.Z. 9</th>
<th>C.Z. 10</th>
<th>C.Z. 12</th>
<th>C.Z. 14</th>
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</thead>
<tbody>
<tr>
<td>High</td>
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<td>CITY OF VERNON GAS SYSTEM</td>
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</tbody>
</table>


---

**Use Buttons to Load and Save Values**

- Load Default Values
- Load Saved Values
- Save to File

---

All results are preliminary and should be subject to extensive QA/QC before interpreting.
Economics Tab (leave unchanged)
View/Edit Rate Structures (leave unchanged)

All results are preliminary and should be subject to extensive QA/QC before interpreting.
View/Edit both standard and low income rates

All results are preliminary and should be subject to extensive QA/QC before interpreting.
View/Edit Rate Structures (leave unchanged)

Rate periods as a function of month and hour

Rate information for each rate period
View/Edit Rate Structures (leave unchanged)
View/Edit Rate Structures (leave unchanged)
Compare Estimated Rate Differences (settings not used for calculation)
Net Metering
Select Net Metering

Net Metering

- No Net Metering (default)
- Use Net Metering

Gasoline and Diesel Prices
- Average Gasoline (All Grades) Retail Price: $2.005 per gallon
- Average Diesel (On-Highway) Retail Price: $3.657 per gallon

Click to Select Net Metering
Select Net Metering

This selection looks for rates identified as “net metering” in Electricity Rate Editor. If no “net metering” rate specified, uses standard rate corresponding CZ and housing type.
Edit Gasoline and Diesel Prices (leave unchanged)
View/Edit Natural Gas Rate Structures
### Natural Gas Rate Structure Editor

The Natural Gas Rate Structure Editor is used to define the rate structure for natural gas appliances. It allows for the specification of rates for different climate zones, appliance types, and usage categories. The editor supports the creation of custom rates and edits existing rate structures.

**Select Utility**: SOUTHERN CALIFORNIA GAS

**Select a Rate to View Details**:

<table>
<thead>
<tr>
<th>Standard Rates</th>
<th>Low Income Rates</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Rate</strong></td>
<td><strong>Appliances (use panel to edit...)</strong></td>
</tr>
<tr>
<td>GR climate zone 1</td>
<td>All Appliances</td>
</tr>
<tr>
<td>GR climate zone 2</td>
<td>All Appliances</td>
</tr>
<tr>
<td>GR climate zone 3</td>
<td>All Appliances</td>
</tr>
<tr>
<td>GR climate zone 1</td>
<td>Primary Space Heat</td>
</tr>
<tr>
<td>GR climate zone 2</td>
<td>Primary Space Heat</td>
</tr>
<tr>
<td>GR climate zone 3</td>
<td>Primary Space Heat</td>
</tr>
<tr>
<td>GR climate zone 1</td>
<td>Range Oven Combination</td>
</tr>
<tr>
<td>GR climate zone 2</td>
<td>Range Oven Combination</td>
</tr>
<tr>
<td>GR climate zone 3</td>
<td>Range Oven Combination</td>
</tr>
</tbody>
</table>

**Appliances**:
- Conventional Water Heater
- Spa Heat
- Auxiliary Space Heating
- Solar Water Heat with Gas Backup
- Range Oven Combination
- Primary Space Heat

**All Appliances**

**Period Codes** (Only Available for Southern California Gas)

- **Edit Zone**
- **Store Revised Zone**

**Specify a period code between 1 and 4**

**Rate Values**

<table>
<thead>
<tr>
<th>Period 1</th>
<th>Period 2</th>
<th>Period 3</th>
<th>Period 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tier 1</td>
<td>Tier 2</td>
<td>Tier 3</td>
<td>Tier 4</td>
</tr>
</tbody>
</table>

**Maximum daily allowance (Therm)**

- **Store Edited Rate Values**

**Monthly Fixed Charge**

- **Store Edited Monthly Fixed Charges**

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Gas Rate Structure Editor tool initialized at 09-Jan-2019 07:40:02. Select a rate to view and edit.
### View/Edit Rate Structures (leave unchanged)

View/Edit both standard and low income rates

#### Rate Selector

<table>
<thead>
<tr>
<th>Rate Selector</th>
<th>SOUTHERN CALIFORNIA GAS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Select Utility</td>
<td>SOUTHERN CALIFORNIA GAS</td>
</tr>
</tbody>
</table>

#### Standard Rates vs. Low Income Rates

<table>
<thead>
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<th>Rate</th>
<th>Appliances</th>
<th>Zone</th>
<th>Single Family</th>
<th>Multi Family</th>
<th>Mobile Home</th>
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</thead>
<tbody>
<tr>
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<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>All Appliances</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>All Appliances</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>All Appliances</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Gas Rate Structure Selector and Editor tool initialized at 09-Jan-2010 97:40:02. Select a rate to view and edit.
View/Edit Rate Structures (leave unchanged)

View/Edit both standard and low income rates
View/Edit Rate Structures (leave unchanged)

<table>
<thead>
<tr>
<th>SR Climate Zone</th>
<th>All Appliances</th>
<th>Zone</th>
<th>SingleFamily</th>
<th>MultiFamily</th>
<th>MobileHome</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>All Appliances</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>All Appliances</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>All Appliances</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Primary Space Heat</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Primary Space Heat</td>
<td>5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Range Oven Combination</td>
<td>6</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Click on rate to view details
View/Edit Rate Structures (leave unchanged)

Rate applies to homes with only selected appliances. Rate labeled as “All Appliances” covers all appliances not directly specified with a rate.
View/Edit Rate Structures (leave unchanged)

Set SoCalGas zone when creating custom rate
View/Edit Rate Structures (leave unchanged)
View/Edit Rate Structures (leave unchanged)

<table>
<thead>
<tr>
<th>Rate Selector</th>
<th>Standard Rates</th>
<th>Low Income Rates</th>
<th>Appliances (use panel to edit —-)</th>
<th>Zone</th>
<th>SingleFamily</th>
<th>MultiFamily</th>
<th>MobileHome</th>
</tr>
</thead>
<tbody>
<tr>
<td>SOUTHERN CALIFORNIA GAS</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Natural Gas Appliances** (rate is valid if home contains only natural gas appliances):
- Conventional Water Heater
- Spa Heat
- Auxiliary Space Heating
- Solar Water Heater
- Pool Heat
- Dryer
- Range Oven Combination
- All Appliances
- Primary Space Heat
- Miscellaneous Other

**Period Codes**
- Jan: 2
- Feb: 2
- Mar: 2
- Apr: 1
- May: 1
- Jun: 1
- Jul: 1
- Aug: 1
- Sep: 1
- Oct: 1
- Nov: 1
- Dec: 2

**Rate Values**

<table>
<thead>
<tr>
<th>Period 1</th>
<th>Period 2</th>
<th>Period 3</th>
<th>Period 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.77787</td>
<td>0.77787</td>
<td>0.77787</td>
<td>0.77787</td>
</tr>
</tbody>
</table>

**Monthly Fixed Charge [B]**

<table>
<thead>
<tr>
<th>Jan</th>
<th>Feb</th>
<th>Mar</th>
<th>Apr</th>
<th>May</th>
<th>Jun</th>
<th>Jul</th>
<th>Aug</th>
<th>Sep</th>
<th>Oct</th>
<th>Nov</th>
<th>Dec</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.22</td>
<td>1.42</td>
<td>2.22</td>
<td>2.22</td>
<td>2.22</td>
<td>2.22</td>
<td>2.22</td>
<td>2.22</td>
<td>2.22</td>
<td>2.22</td>
<td>2.22</td>
<td>2.22</td>
</tr>
</tbody>
</table>

Gas Rate Structure Selector and Editor tool initialized at 09-Jan-2019 07:40:02. Select a rate to view and edit.
View/Edit Rate Structures (leave unchanged)

<table>
<thead>
<tr>
<th>Standard Rules</th>
<th>Low Income Rates</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rate</td>
<td>Appliances (use panel to edit ——)</td>
</tr>
<tr>
<td>SR climate zone 1</td>
<td>All Appliances</td>
</tr>
<tr>
<td>SR climate zone 2</td>
<td>All Appliances</td>
</tr>
<tr>
<td>SR climate zone 3</td>
<td>All Appliances</td>
</tr>
<tr>
<td>SR climate zone 1</td>
<td>Primary Space Heat</td>
</tr>
<tr>
<td>SR climate zone 2</td>
<td>Primary Space Heat</td>
</tr>
<tr>
<td>SR climate zone 3</td>
<td>Primary Space Heat</td>
</tr>
<tr>
<td>SR climate zone 1</td>
<td>Range Oven Combination</td>
</tr>
<tr>
<td>SR climate zone 2</td>
<td>Range Oven Combination</td>
</tr>
<tr>
<td>SR climate zone 3</td>
<td>Range Oven Combination</td>
</tr>
</tbody>
</table>

View/edit monthly fixed charges
Table must be used when adding new natural gas appliances
Computation Panel (Run Simulation)

Push "Compute Results" to start computation
Computation Panel (View Simulation Status)
Computation Panel (Save Setup & Results)
Computation Panel (Save Setup & Results)

Four files are created when clicking “Save Setup and Results”

- (“Filename”).setup is a binary file containing all the app settings. This can be loaded into NEAT with “File” menu.
- (“Filename”).results is a binary file containing the results of the run that can be loaded into NEAT with “File” menu.
- (“Filename”)_setup.txt is a text file containing all input parameters for use outside NEAT. Could be up to 12 MB.
- (“Filename”)_results.txt is a text file containing all results for use outside NEAT. Could be up to 225 MB.
Results Panel (tools for viewing and analyzing simulation)
Results Panel (tools for viewing and analyzing simulation)

Option to view specific climate zones, housing categories, and utilities

Press “Analyze” after selections are made
Results Panel (Select Cost Effectiveness Subset)
Results Panel (Select Cost Effectiveness Subset)
Results Panel (Select Cost Effectiveness Subset)
Results Panel (Select Cost Effectiveness Subset)

Change subset of homes in CE space to study using dials
Results Panel (Select Cost Effectiveness Subset)

Update table after making changes to see number of homes selected.
Results Panel (Cost Effectiveness)

<table>
<thead>
<tr>
<th>Region</th>
<th>Species</th>
<th>Mean</th>
<th>Median</th>
<th>Min</th>
<th>Max</th>
<th>2988s</th>
<th># of Homes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Red NOx</td>
<td>-0.0254</td>
<td>-0.0023</td>
<td>-1.00</td>
<td>-0.0005</td>
<td>2688s</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>Yellow NOx</td>
<td>-0.0254</td>
<td>-0.0023</td>
<td>-1.00</td>
<td>-0.0005</td>
<td>2688s</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>Green NOx</td>
<td>-0.0254</td>
<td>-0.0023</td>
<td>-1.00</td>
<td>-0.0005</td>
<td>2688s</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>Red CO2</td>
<td>-3.48 +0.3</td>
<td>-2.48</td>
<td>-3.17 +0.8</td>
<td>-6.80</td>
<td>2688s</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>Yellow CO2</td>
<td>-3.48 +0.3</td>
<td>-2.48</td>
<td>-3.17 +0.8</td>
<td>-6.80</td>
<td>2688s</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>Green CO2</td>
<td>-3.48 +0.3</td>
<td>-2.48</td>
<td>-3.17 +0.8</td>
<td>-6.80</td>
<td>2688s</td>
<td>6</td>
<td></td>
</tr>
</tbody>
</table>

Previous computation loaded. Run computed at 09-Jan-2019 09:32:41

RETURN TO PREVIOUS    ADVANCE TO NEXT
Results Panel (Appliance Mix)

South Coast Air Quality Management District
Results Panel (Appliance Mix)
More complex example for this slide only
Results Panel (Apply Prescribed Funding)

Enter funding amount and cost share for calculation.
Results Panel (Apply Prescribed Funding)
Results Panel (Apply Prescribed Funding)
Results Panel (Apply Prescribed Funding)

South Coast Air Quality Management District

Click on cost to view histogram
Results Panel (Query Individual Homes)
Results Panel (Query Individual Homes)
Results Panel (Query Individual Homes)

Click on home to view details

<table>
<thead>
<tr>
<th>Analyzer</th>
<th>Demand</th>
<th>Demand Input Summary</th>
<th>Power Supply</th>
<th>Economics</th>
<th>Computation</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Analyze Most Recent Results</td>
<td>Analyze Saved Results</td>
<td>Select Cost Effectiveness Subset</td>
<td>Cost Effectiveness</td>
<td>Appliance Mix</td>
<td>Apply Prescribed Funding</td>
<td>Query Individual Homes</td>
</tr>
</tbody>
</table>

Filter Homes
- Climate Zones: 0 Coastal, 15 S. Inland, 9 S. Near-Coastal, 9 N. Near-Coastal, 16 Mountain, All Climate Zones
- Housing Category: Only Single Family Homes, Only Mobile Homes, Only Mult Family Homes, All Housing Types
- Natural Gas Utilities: Long Beach Gas & Oil, Southwest Gas Corp.
- Southern California Gas, City of Vernon Gas System
- Electric Utilities: Anaheim Light & Power, Bear Valley Electric Service, Burbank Water & Power, City of Anaheim Public Utilities Department, City of Banning Electric Department, City of Corona Department of Water & Power, City of Riverside, City of San Bernardino, City of San Diego Electric Utility, Southern California Edison

Specify Regions of Cost Effectiveness Space:
- Green NOx
- Green CO2e
- Yellow NOx
- Yellow CO2e
- Red NOx
- Red CO2e

Specify Costs of Use:
- [Cost Delta Delta] [Cost Delta S]
- [Cost Delta S Delta] [Cost Delta t]

Select a home to populate panels on right:
- Sort NOx, Sort CO2e, Sort #Homes

Home Details
- Hour type: Single Family
- Climate zone: C240
- Electric utility: Bear Valley Electric Service
- Electric rate with standard income: Standard

Base-case electric rate description:
- D Domestic Service Single Family Accommodation
- D Domestic Service Single Family Accommodation
- Gas Utility: Southwest Gas Corp.
- Gas rate with standard income: Standard

Baseline Appliance Mix
- Natural Gas: Range Oven Combination
- Natural Gas: Range Oven Combination
- Electrical: Range Oven Combination
- Electrical: Range Oven Combination

Fuel | Appliance | Quantity
---|----------|--------
Natural Gas | Conventional Water Heater | 1
Electric | Dishwasher | 1
Electric | First Refrigerator | 1
Electric | Second Refrigerator | 1
Electric | Microwave | 1
Natural Gas | Range Oven Combination | 1
Natural Gas | Range Oven Combination | 1
Electric | Clothes Washer | 1
Natural Gas | Dryer | 1
Electric | TV | 1
Electric | Outdoor Lighting | 1
Electric | Outdoor Lighting | 1
Electric | PC | 1
Electric | Other | 1
Electric | Pool Pump | 1
Electric | Fan | 1
Natural Gas | Primary Heat | 1
Electric | Attic Casing Fan | 1
Electric | Central Air Conditioning | 1

More Information | View CZ Map | Analyze

MI:ENAT-software_var-1.110\Results/CZ6allCsz_ElecWH_Solar_for_mtg.results loaded.
Run computed at 09-Jan-2019 10:56:25
Results Panel (Query Individual Homes)
Results Panel (Query Individual Homes)
Results Panel (Query Individual Homes)
Results Panel (Query Individual Homes)
Next Steps

• Full integration of battery module
• Intensive QA/QC of the tool
• Beta version to be released to working group members
Discussion and Public Comment