

Net Emissions Analysis Tool (NEAT) Working Group

*Formally the Residential Commercial Appliance Life
Cycle Analysis Working Group*

Meeting #4
April 18, 2018



Summary of Submitted Comments, Responses, and Updates

Scott A. Epstein Ph.D.

*Planning, Rule Development, and Area Sources
Division*



Development Progress

Residential NEAT	Not Yet Started	In Progress	Draft Complete	WG meeting #
Building of tool framework (GUI, file I/O)			X	2
Collection of input data			X	2
Demand segment of tool			X	2, 3
Implementation of distributed solar			X	2
Implementation of distributed battery storage		X		Future
Electric Rate Calculator			X	3
Natural Gas Rate Calculator			X	4
Implementation of net metering			X	3
Solar and battery cost calculator			X	Future
Electric generation emission factors • Advanced EFs: Implementation of HiGRID		X	X	3, 4
Fugitive methane from Natural Gas Use			X	4
Electricity transportation loss			X	Future
Results analysis tools		X		Future

Summary of Submitted Comments

- Four comment letters submitted to date
- Staff appreciates the thoughtful feedback during the meetings and in the comment letters
- All comment letters posted to the NEAT website
 - <http://www.aqmd.gov/home/air-quality/clean-air-plans/air-quality-mgt-plan/neat-working-group>

The screenshot shows the South Coast AQMD website page for the Net Emissions Analysis Tool (NEAT) working group. The page title is "Net Emissions Analysis Tool (NEAT), formally known as the LifeCycle Analysis Working Group". The main content area states: "The purpose of this working groups is to assess the cost-effectiveness of technologies and life-cycle emissions." Below this, there is a detailed paragraph explaining the working group's formation and goals. To the right, there is a "YOU MAY ALSO LIKE ..." section with links to "Business", "Local Government", "Rules", and "Organization". At the bottom, there are two columns of meeting information: "Working Group Meeting #3" (Wednesday, January 31, 2018, 2:00 p.m.) and "Working Group Meeting #2" (Thursday, November 16, 2017, 9:00 a.m.). Each meeting listing includes the location (South Coast Air Quality Management District, Conference Room CC-8, 21865 Copley Drive, Diamond Bar, CA 91765) and a list of documents available for download, such as Agendas, Presentations, and Alternative Technology Lists.



Summary of Submitted Comments (continued)

Look into using WattTime to estimate marginal emissions

- *Currently pursuing a contract with APEP at UCI to integrate HiGRID into NEAT*
- *HiGRID will capture marginal emissions changes*

Add Gas Heat-Pump Water Heaters to alternative technology list

- *This technology was added to NEAT*

Add Micro Combined Heat and Power and Residential-Scale Fuel Cells to alternative technology list

- *These technologies will require a significant amount of development time to include in NEAT*
- *If technology becomes more widely implemented, inclusion will be considered for future updates. May require contracting outside experts to model fuel cells.*



Summary of Submitted Comments (continued)

Consider the costs of additional barriers to appliance retrofits

- *Barriers to appliance retrofits such as household infrastructure upgrades may pose additional costs*
- *Costs can be considered on a case-by-case basis and can be implemented in the “installation cost” field in the Demand module*
- *Modified the embedded documentation describing “Installation Cost”*

“Install Cost: The average cost of installing the appliance in US dollars. This should include the cost of labor along with other major modifications that may be needed for installation such as wiring, plumbing, electric or gas upgrades, and/or asbestos removal. The NEAT software amortizes this installation cost based on the lifetime specified by the user.”

Summary of Submitted Comments (continued)

Incorporate California Alternative Rates for Energy (CARE) into NEAT

- *NEAT was modified to include low income rates for every gas and electric utility with a low income rate option (utilities with fixed low income benefits were not treated as the low income benefit is the same in the base-case and scenario-case)*
- *We analyzed IPUMS harmonized American Community Survey data from 2016 to determine the percentage of homes in each gas/electric utility combination, Climate Zone, and housing category that are eligible based on the specific low income rate qualification criteria*
- *Eligibility percentages are modifiable in the Electric Rate and Gas Rate Selection tools*



Summary of Submitted Comments (continued)

Electricity emission factor options should reflect realistic or achievable scenarios

HOUSEHOLD

- Option to install rooftop PV
- Option to install residential battery
(costs and changes in electricity demand calculated)



South Coast
Air Quality Management District

GRID

Increased Electricity Use

- Lower limit on Emissions
 - Ø All additional power from centralized PV
- Best-guess Emissions (default option)
 - Ø All additional power calculated with marginal Emissions Factor Analysis from CEMS data
- Upper limit on Emissions
 - Ø All additional power from peaker plants
- Rigorous Emissions Analysis
 - Ø Additional emissions calculated with HiGRID

Reduced Electricity Use

- Best-guess Emissions (default option)
 - Ø Emissions reductions calculated with marginal Emissions Factor Analysis from CEMS data
- Lower limit on Emissions
 - Ø Reductions arise from curtailing peaker plants
- Rigorous Emissions Analysis
 - Ø Additional emissions calculated with HiGRID

Fugitive Methane Emissions from Residential and Electric Generation Natural Gas Usage

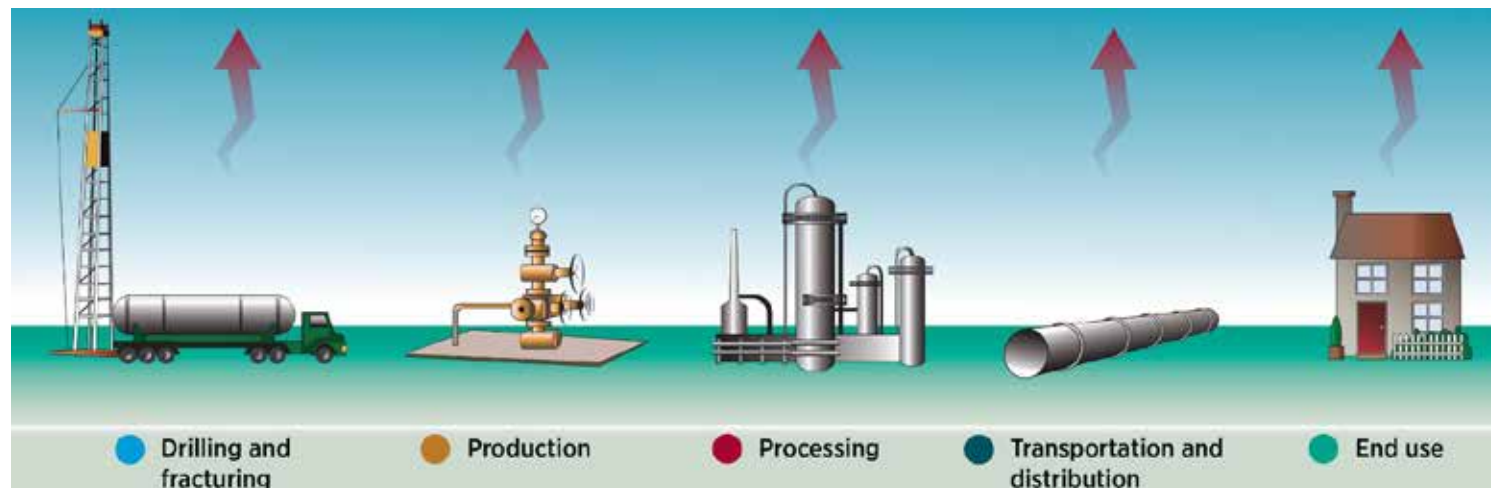
Scott A. Epstein Ph.D.

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Fugitive Methane Emissions Considerations

- Methane emissions occur throughout lifecycle and must be considered for natural gas appliance usage and natural gas fired power generation
- Not aware of any estimates of fugitive methane resulting from marginal changes in natural gas use
- Until marginal studies/inventories are available, plan to use leakage rates based on average usage



Fugitive Methane Emissions Considerations

- Fugitive methane leak rates are modifiable parameters in NEAT
- NEAT separates into production, processing, transmission, distribution, and end use
- Four estimates are provided, but not presented as a comprehensive list; other recommendations are welcome.
- To date, we've reached out to CEC, CARB, Argonne National Lab (GREET), Environmental Defense Fund, and EPA for advice
- **What default numbers should NEAT use? What values should be options in NEAT? *Actual choice for policymaking should be addressed in other forums.***



Fugitive Natural Gas Leak Rates

	Title	Leak Rate	Source	Considerations
A	EPA GhG Emissions Inventory	1.27% (95% CI 1.08 to 1.48%)	2018 Draft Inventory of US GhG Emissions and Sinks: 1990-2016	<ul style="list-style-type: none"> • Bottom-up inventory updated every year • New inventory includes estimate from abandoned wells • Evidence that super-emitters are underestimated • Active stakeholder input in development of inventory • Behind-the-meter leakage not included • Used in CA-GREET & CA-LCFS
B	The 16 Study Series	1.7% (95% CI 1.3 to 2.2%)	Collaborative effort with 100 institutions spearheaded by Environmental Defense Fund. Synthesis Report Published in Littlefield et al. 2017*	<ul style="list-style-type: none"> • Inventory that includes site-level unassigned emissions • Top-down, bottom-up, & mobile measurement techniques • Summary of studies and references https://www.edf.org/sites/default/files/methane_studies_fact_sheet.pdf
C	Sierra Club comments	3.30%	EPA GhG emissions inventory, Marchese et al. 2015, Zimmerle et al. 2015, Lamb et al. 2015, conversations with experts at EDF	<ul style="list-style-type: none"> • Well-to-building leakage rate • Includes super-emitters • Does not include future voluntary reduction goals or higher leakage rates from growth in unconventional drilling
D	Sustainable Analysis, LLC comments	5.1%	13 Peer-reviewed publications and LBNL report	<ul style="list-style-type: none"> • Integrates studies of production-zone leakage, CA tower measurements, and residential leakage estimates • Weighted average of study results • California Specific

Comments on Fugitive Natural Gas

1. Allow user to use either a 20-year or 100 year global warming potential (GWP) value
2. Use a 20-year GWP
 - *A 20-year GWP more accurately reflects the timeframe of climate change effects*
 - *Atmospheric lifespan of methane is 12 years*
 - *Both options are available in the tool, but 20-year timeframe is set as the default*



Comments on Fugitive Natural Gas (continued)

Methodology recommendations for considering methane leakage

- Consider fugitive methane along all stages of the lifecycle of natural gas: exploration, production, processing, storage, transmission, distribution, end use
 - *We consider fugitive methane from all stages for both in-home use and centralized energy generation*
- CEC report “A survey of Methane Emissions from the California Natural Gas System” by Fischer et al. 2017 contains in-home measurements of methane leakage
 - *This is a great reference for in-home measurements. Evaluated 10 homes in SF Bay Area. Current CEC project to measure 50-75 homes across all CA. Other in-home leak rate studies would be appreciated*



Comments on Fugitive Natural Gas (continued)

Methodology recommendations for considering methane leakage

- Bottom-up emission inventories such as the EPA Greenhouse Gas Inventory report lower emissions than in top-down studies
 - *We are aware of these discrepancies and will be mentioned in the documentation embedded within the tool.*
- Reference the broader body of scientific literature rather than relying on inventories alone when calculating methane leakage estimates
 - *Methane leakage rates are a modifiable parameter in NEAT, allowing the user to input results from specific studies if desired.*
- Use EPA Greenhouse Gas Inventory to be consistent with reporting at national and international levels

Future Inventory Development

- Yearly Improvements in EPA GHG Inventory
 - Behind-the-meter emissions incorporation is planned
- CARB is working with Stanford to update California specific methane leakage rate as part of the Oil Production Greenhouse Gas Emissions Estimator
 - Anticipated release in 2019
- Any other upcoming references we should be aware of?



Calculation of Natural Gas Rates and the Embedded Natural Gas Rate Structure Editor Tool

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Natural Gas Rate Structures

- Many gas utilities within the Basin
- Many different rate structures for each utility
- Analyzed census data and utility jurisdiction data to determine number of households in each utility, climate zone, category
- Analyzed IPUMS harmonized American Community Survey data to determine the percentage of homes in each gas/electric utility combination, Climate Zone, and housing category that are eligible based on the specific low income rate qualification criteria



http://www.energy.ca.gov/maps/serviceareas/natural_gas_service_areas.pdf



Natural Gas Rate Structure

Number of Households for Climate Zone 9

	CZ = 9	CZ = 9	CZ = 9	All CZ
	SingleFamily	MultiFamily	MobileHome	TOTAL
City of Vernon Gas System	1012	958	11	12960
Long Beach Gas & Oil	0	0	0	186019
Southern California Gas Zone 1	991898	1002946	26552	5249715
Southwest Gas Corp.	0	0	0	23660
Southern California Gas Zone 2	0	0	0	40024
Southern California Gas Zone 3	0	0	0	34442



Natural Gas Rate Structure Editor Tool

- Separate tool linked from NEAT
- Allows “advanced” users to graphically view and edit natural gas rates
- Tool populated with default values but everything is editable
 - Choose rate to use for single family, multi family, mobile homes
 - Choose low income rate to use for single family, multi family, mobile homes
 - Modify fraction of homes in each gas/electric utility combination eligible for low income rates
- Utility rates obtained from each individual utility



Natural Gas Rate Structure Editor Tool

Ability to view/edit rates
from every utility in SoCAB

Gas Rate Structure Selector and Editor v 1.1

Rate Selector **Low Income Rates Qualification**

Select Utility: SOUTHERN CALIFORNIA GAS

Select a Rate to View Details:

Standard Rates	Low Income Rates	Appliances (use panel to edit -->)	Zone	SingleFamily	MultiFamily	MobileHome
GR climate zone 1	All Appliances		1	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
GR climate zone 2	All Appliances		2	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
GR climate zone 3	All Appliances		3	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
GR climate zone 1	Primary Space Heat		1	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
GR climate zone 2	Primary Space Heat		2	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
GR climate zone 3	Primary Space Heat		3	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
GR climate zone 1	Primary Space Heat		1	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
GR climate zone 2	Primary Space Heat		2	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
GR climate zone 3	Primary Space Heat		3	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
GR all climate zones	Conventional Water Heater, Range Oven Combination, Solar W...		all	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
GR climate zone 1	All Appliances		1	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
GR climate zone 2	All Appliances		2	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
GR climate zone 3	All Appliances		3	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
GR climate zone 1	Primary Space Heat, Range Oven Combination		1	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
GR climate zone 2	Primary Space Heat, Range Oven Combination		2	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
GR climate zone 3	Primary Space Heat, Range Oven Combination		3	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
GR all climate zones	Range Oven Combination		all	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
GR all climate zones	Conventional Water Heater, Solar Water Heat with Gas Backup		all	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
GR climate zone 1	Conventional Water Heater, Primary Space Heat, Solar Water ...		1	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
GR climate zone 2	Conventional Water Heater, Primary Space Heat, Solar Water ...		2	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
GR climate zone 3	Conventional Water Heater, Primary Space Heat, Solar Water ...		3	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
GR CARE climate zone 1	All Appliances		1	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
GR CARE climate zone 2	All Appliances		2	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
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Natural Gas Appliances (rate is valid if home contains only selected gas appliances)

Conventional Water Heater Spa Heat Auxiliary Space Heating

Solar Water Heat with Gas Backup Pool Heat Dryer

Range Oven Combination Primary Space Heat Miscellaneous Other

All Appliances

Southern California Gas Zone Editor (Only Available for Southern California Gas)

Edit Zone: 1 Store Revised Zone

Period Codes

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2	2	2	2	2	1	1	1	1	2	2	2

Specify a period code between 1 and 4 Store Period Codes

Rate Values

Period 1 Period 2 Period 3 Period 4

Rate information shown for selected period. NaN indicates no rate or maximum at that tier.

	Tier1	Tier2	Tier3	Tier4	Tier5
Maximum daily allowance [therm]	0.473	NaN	NaN	NaN	NaN
Rate [\$ /therm]	0.97914	1.3076	NaN	NaN	NaN

Store Edited Rate Values

Monthly Fixed Charge [\$]

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
5.1	4.6	5.1	4.93	5.1	4.93	5.1	5.1	4.93	5.1	4.93	5.1

Store Edited Monthly Fixed Charges

RESET ALL TO DEFAULT LOAD ALL FROM FILE SAVE ALL TO FILE

Gas Rate Structure Selector and Editor tool initialized at 29-Mar-2018 09:16:24. Select a rate to view and edit.



Natural Gas Rate Structure Editor Tool

Gas Rate Structure Selector and Editor v 1.1

Rate Selector: Low Income Rates Qualification

Select Utility: SOUTHERN CALIFORNIA GAS

Select a Rate to View Details:

Standard Rates	Low Income Rates	Rate	Appliances (use panel to edit -->)	Zone	SingleFamily	MultiFamily	MobileHome
		GR climate zone 1	All Appliances	1	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
		GR climate zone 2	All Appliances	2	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
		GR climate zone 3	All Appliances	3	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
		GR climate zone 1	Primary Space Heat	1	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
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		GR climate zone 1	Primary Space Heat	1	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
		GR climate zone 2	Primary Space Heat	2	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
		GR climate zone 3	Primary Space Heat	3	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
		GR all climate zones	Conventional Water Heater, Range Oven Combination, Solar W...	all	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
		GR climate zone 1	All Appliances	1	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
		GR climate zone 2	All Appliances	2	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
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		GR climate zone 3	Primary Space Heat, Range Oven Combination	3	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
		GR all climate zones	Range Oven Combination	all	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
		GR all climate zones	Conventional Water Heater, Solar Water Heat with Gas Backup	all	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
		GR climate zone 1	Conventional Water Heater, Primary Space Heat, Solar Water ...	1	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
		GR climate zone 2	Conventional Water Heater, Primary Space Heat, Solar Water ...	2	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
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		GR CARE climate zone 2	Primary Space Heat	2	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
		GR CARE climate zone 3	Primary Space Heat	3	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Clicking on a specific rate pulls up additional information on right

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All Appliances

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Edit Zone: 1 Store Revised Zone

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Rate [\$ /therm]	0.97914	1.3076	NaN	NaN	NaN

Store Edited Rate Values

Monthly Fixed Charge [\$]

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
5.1	4.6	5.1	4.93	5.1	4.93	5.1	5.1	4.93	5.1	4.93	5.1

Store Edited Monthly Fixed Charges

RESET ALL TO DEFAULT LOAD ALL FROM FILE SAVE ALL TO FILE

Gas Rate Structure Selector and Editor tool initialized at 29-Mar-2018 09:16:24. Select a rate to view and edit.



Natural Gas Rate Structure Editor Tool

Gas Rate Structure Selector and Editor v 1.1

Rate Selector: **Low Income Rates Qualification**

Select Utility: **SOUTHERN CALIFORNIA GAS** [Next Utility] [+ Add Custom Rate] [Previous Utility] [Store Revised Table]

Select a Rate to View Details:

Standard Rates	Low Income Rates	Zone	SingleFamily	MultiFamily	MobileHome
GR climate zone 1	All Appliances	1	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
GR climate zone 2	All Appliances	2	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
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GR all climate zones	Range Oven Combination	all	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
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GR CARE climate zone 2	Primary Space Heat	2	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
GR CARE climate zone 3	Primary Space Heat	3	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Gas Rate Structure Selector and Editor tool initialized at 29-Mar-2018 09:16:24. Select a rate to view and edit.

User can add a custom rate

Natural Gas Appliances (rate is valid if home contains only selected gas appliances)

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Range Oven Combination Primary Space Heat Miscellaneous Other

All Appliances

Southern California Gas Zone Editor (Only Available for Southern California Gas)

Edit Zone: **1** [Store Revised Zone]

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Rate [\$ /therm]	0.97914	1.3076	NaN	NaN	NaN

[Store Edited Rate Values]

Monthly Fixed Charge [\$]

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5.1	4.6	5.1	4.93	5.1	4.93	5.1	5.1	4.93	5.1	4.93	5.1

[Store Edited Monthly Fixed Charges]

[RESET ALL TO DEFAULT] [LOAD ALL FROM FILE] [SAVE ALL TO FILE]

Natural Gas Rate Structure Editor Tool

Gas Rate Structure Selector and Editor v 1.1

Rate Selector: **Low Income Rates Qualification**

Select Utility: **SOUTHERN CALIFORNIA GAS**

Select a Rate to View Details:

Standard Rates | **Low Income Rates** ← **User can switch between Standard Rates and Low Income Rates**

Rate	Appliances	Climate Zone	Single Family	MultiFamily	MobileHome
GR climate zone 1	All Appliances	1	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
GR climate zone 2	All Appliances	2	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
GR climate zone 3	All Appliances	3	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
GR climate zone 1	Primary Space Heat	1	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
GR climate zone 2	Primary Space Heat	2	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
GR climate zone 3	Primary Space Heat	3	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
GR climate zone 1	Primary Space Heat	1	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
GR climate zone 2	Primary Space Heat	2	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
GR climate zone 3	Primary Space Heat	3	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
GR all climate zones	Conventional Water Heater, Range Oven Combination, Solar W...	all	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
GR climate zone 1	All Appliances	1	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
GR climate zone 2	All Appliances	2	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
GR climate zone 3	All Appliances	3	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
GR climate zone 1	Primary Space Heat, Range Oven Combination	1	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
GR climate zone 2	Primary Space Heat, Range Oven Combination	2	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
GR climate zone 3	Primary Space Heat, Range Oven Combination	3	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
GR all climate zones	Range Oven Combination	all	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
GR all climate zones	Conventional Water Heater, Solar Water Heat with Gas Backup	all	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
GR climate zone 1	Conventional Water Heater, Primary Space Heat, Solar Water ...	1	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
GR climate zone 2	Conventional Water Heater, Primary Space Heat, Solar Water ...	2	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
GR climate zone 3	Conventional Water Heater, Primary Space Heat, Solar Water ...	3	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
GR CARE climate zone 1	All Appliances	1	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
GR CARE climate zone 2	All Appliances	2	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
GR CARE climate zone 3	All Appliances	3	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
GR CARE climate zone 1	Primary Space Heat	1	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
GR CARE climate zone 2	Primary Space Heat	2	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
GR CARE climate zone 3	Primary Space Heat	3	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Natural Gas Appliances (rate is valid if home contains only selected gas appliances)

Conventional Water Heater Spa Heat Auxiliary Space Heating

Solar Water Heat with Gas Backup Pool Heat Dryer

Range Oven Combination Primary Space Heat Miscellaneous Other

All Appliances

Southern California Gas Zone Editor (Only Available for Southern California Gas)

Edit Zone: **1** Store Revised Zone

Period Codes

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2	2	2	2	2	1	1	1	1	2	2	2

Specify a period code between 1 and 4 Store Period Codes

Rate Values

Period 1 | **Period 2** | Period 3 | Period 4

Rate information shown for selected period. NaN indicates no rate or maximum at that tier.

	Tier1	Tier2	Tier3	Tier4	Tier5
Maximum daily allowance [therm]	0.473	NaN	NaN	NaN	NaN
Rate [\$ /therm]	0.97914	1.3076	NaN	NaN	NaN

Store Edited Rate Values

Monthly Fixed Charge [\$]

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
5.1	4.6	5.1	4.93	5.1	4.93	5.1	5.1	4.93	5.1	4.93	5.1

Store Edited Monthly Fixed Charges

RESET ALL TO DEFAULT LOAD ALL FROM FILE SAVE ALL TO FILE

Gas Rate Structure Selector and Editor tool initialized at 29-Mar-2018 09:16:24. Select a rate to view and edit.



Natural Gas Rate Structure Editor Tool

Gas Rate Structure Selector and Editor v 1.1

Rate Selector: Low Income Rates Qualification

Select Utility: SOUTHERN CALIFORNIA GAS

Select a Rate to View Details:

Standard Rates	Low Income Rates	Appliances (use panel to edit -->)	Zone	SingleFamily	MultiFamily	MobileHome
GR climate zone 1	All Appliances		1	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
GR climate zone 2	All Appliances		2	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
GR climate zone 3	All Appliances		3	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
GR climate zone 1	Primary Space Heat		1	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
GR climate zone 2	Primary Space Heat		2	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
GR climate zone 3	Primary Space Heat		3	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
GR climate zone 1	Primary Space Heat		1	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
GR climate zone 2	Primary Space Heat		2	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
GR climate zone 3	Primary Space Heat		3	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
GR all climate zones	Conventional Water Heater, Range Oven Combination, Solar W...		all	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
GR climate zone 1	All Appliances		1	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
GR climate zone 2	All Appliances		2	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
GR climate zone 3	All Appliances		3	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
GR climate zone 1	Primary Space Heat, Range Oven Combination		1	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
GR climate zone 2	Primary Space Heat, Range Oven Combination		2	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
GR climate zone 3	Primary Space Heat, Range Oven Combination		3	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
GR all climate zones	Range Oven Combination		all	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
GR all climate zones	Conventional Water Heater, Solar Water Heat with Gas Backup		all	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
GR climate zone 1	Conventional Water Heater, Primary Space Heat, Solar Water ...		1	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
GR climate zone 2	Conventional Water Heater, Primary Space Heat, Solar Water ...		2	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
GR climate zone 3	Conventional Water Heater, Primary Space Heat, Solar Water ...		3	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
GR CARE climate zone 1	All Appliances		1	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
GR CARE climate zone 2	All Appliances		2	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
GR CARE climate zone 3	All Appliances		3	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
GR CARE climate zone 1	Primary Space Heat		1	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
GR CARE climate zone 2	Primary Space Heat		2	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
GR CARE climate zone 3	Primary Space Heat		3	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Some utilities have rates that correspond to households with a specific set of appliances

Natural Gas Appliances (rate is valid if home contains only selected gas appliances)

Conventional Water Heater Spa Heat Auxiliary Space Heating

Solar Water Heat with Gas Backup Pool Heat Dryer

Range Oven Combination Primary Space Heat Miscellaneous Other

All Appliances

Southern California Gas Zone Editor (Only Available for Southern California Gas)

Edit Zone: 1 Store Revised Zone

Period Codes

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2	2	2	2	2	1	1	1	1	2	2	2

Specify a period code between 1 and 4 Store Period Codes

Rate Values

Period 1 Period 2 Period 3 Period 4

Rate information shown for selected period. NaN indicates no rate or maximum at that tier.

	Tier1	Tier2	Tier3	Tier4	Tier5
Maximum daily allowance [therm]	0.473	NaN	NaN	NaN	NaN
Rate [\$ /therm]	0.97914	1.3076	NaN	NaN	NaN

Store Edited Rate Values

Monthly Fixed Charge [\$]

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
5.1	4.6	5.1	4.93	5.1	4.93	5.1	5.1	4.93	5.1	4.93	5.1

Store Edited Monthly Fixed Charges

RESET ALL TO DEFAULT LOAD ALL FROM FILE SAVE ALL TO FILE

Gas Rate Structure Selector and Editor tool initialized at 29-Mar-2018 09:16:24. Select a rate to view and edit.



Natural Gas Rate Structure Editor Tool

Gas Rate Structure Selector and Editor v 1.1

Rate Selector: Low Income Rates Qualification

Select Utility: SOUTHERN CALIFORNIA GAS

Select a Rate to View Details:

Set of appliances corresponding to each rate are editable

Rate	Appliances (use panel to edit -->)	Zone	Conventional Water Heater	Solar Water Heat with Gas Backup	Range Oven Combination	Primary Space Heat	MobileHome
GR climate zone 1	All Appliances	1	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
GR climate zone 2	All Appliances	2	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
GR climate zone 3	All Appliances	3	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
GR climate zone 1	Primary Space Heat	1	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
GR climate zone 2	Primary Space Heat	2	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
GR climate zone 3	Primary Space Heat	3	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
GR climate zone 1	Primary Space Heat	1	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
GR climate zone 2	Primary Space Heat	2	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
GR climate zone 3	Primary Space Heat	3	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
GR all climate zones	Conventional Water Heater, Range Oven Combination, Solar W...	all	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
GR climate zone 1	All Appliances	1	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
GR climate zone 2	All Appliances	2	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
GR climate zone 3	All Appliances	3	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
GR climate zone 1	Primary Space Heat, Range Oven Combination	1	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
GR climate zone 2	Primary Space Heat, Range Oven Combination	2	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
GR climate zone 3	Primary Space Heat, Range Oven Combination	3	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
GR all climate zones	Range Oven Combination	all	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
GR all climate zones	Conventional Water Heater, Solar Water Heat with Gas Backup	all	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
GR climate zone 1	Conventional Water Heater, Primary Space Heat, Solar Water ...	1	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
GR climate zone 2	Conventional Water Heater, Primary Space Heat, Solar Water ...	2	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
GR climate zone 3	Conventional Water Heater, Primary Space Heat, Solar Water ...	3	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
GR CARE climate zone 1	All Appliances	1	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
GR CARE climate zone 2	All Appliances	2	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
GR CARE climate zone 3	All Appliances	3	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
GR CARE climate zone 1	Primary Space Heat	1	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
GR CARE climate zone 2	Primary Space Heat	2	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
GR CARE climate zone 3	Primary Space Heat	3	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Natural Gas Appliances (rate is valid if home contains only selected gas appliances)

Conventional Water Heater Spa Heat Auxiliary Space Heating

Solar Water Heat with Gas Backup Pool Heat Dryer

Range Oven Combination Primary Space Heat Miscellaneous Other

All Appliances

Southern California Gas Zone Editor (Only Available for Southern California Gas)

Edit Zone: 1 Store Revised Zone

Period Codes

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2	2	2	2	2	1	1	1	1	2	2	2

Specify a period code between 1 and 4 Store Period Codes

Rate Values

Period 1 Period 2 Period 3 Period 4

Rate information shown for selected period. NaN indicates no rate or maximum at that tier.

	Tier1	Tier2	Tier3	Tier4	Tier5
Maximum daily allowance [therm]	0.473	NaN	NaN	NaN	NaN
Rate [\$ /therm]	0.97914	1.3076	NaN	NaN	NaN

Store Edited Rate Values

Monthly Fixed Charge [\$]

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
5.1	4.6	5.1	4.93	5.1	4.93	5.1	5.1	4.93	5.1	4.93	5.1

Store Edited Monthly Fixed Charges

RESET ALL TO DEFAULT LOAD ALL FROM FILE SAVE ALL TO FILE

Gas Rate Structure Selector and Editor tool initialized at 29-Mar-2018 09:16:24. Select a rate to view and edit.



Natural Gas Rate Structure Editor Tool

Gas Rate Structure Selector and Editor v 1.1

Rate Selector: Low Income Rates Qualification

Select Utility: SOUTHERN CALIFORNIA GAS

Select a Rate to View Details:

Standard Rates	Low Income Rates	Zone	SingleFamily	MultiFamily	MobileHome
GR climate zone 1	All Appliances	1	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
GR climate zone 2	All Appliances	2	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
GR climate zone 3	All Appliances	3	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
GR climate zone 1	Primary Space Heat	1	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
GR climate zone 2	Primary Space Heat	2	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
GR climate zone 3	Primary Space Heat	3	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
GR climate zone 1	Primary Space Heat	1	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
GR climate zone 2	Primary Space Heat	2	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
GR climate zone 3	Primary Space Heat	3	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
GR all climate zones	Conventional Water Heater, Range Oven Combination, Solar W...	all	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
GR climate zone 1	All Appliances	1	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
GR climate zone 2	All Appliances	2	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
GR climate zone 3	All Appliances	3	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
GR climate zone 1	Primary Space Heat, Range Oven Combination	1	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
GR climate zone 2	Primary Space Heat, Range Oven Combination	2	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
GR climate zone 3	Primary Space Heat, Range Oven Combination	3	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
GR all climate zones	Range Oven Combination	all	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
GR all climate zones	Conventional Water Heater, Solar Water Heat with Gas Backup	all	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
GR climate zone 1	Conventional Water Heater, Primary Space Heat, Solar Water ...	1	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
GR climate zone 2	Conventional Water Heater, Primary Space Heat, Solar Water ...	2	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
GR climate zone 3	Conventional Water Heater, Primary Space Heat, Solar Water ...	3	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
GR CARE climate zone 1	All Appliances	1	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
GR CARE climate zone 2	All Appliances	2	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
GR CARE climate zone 3	All Appliances	3	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
GR CARE climate zone 1	Primary Space Heat	1	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
GR CARE climate zone 2	Primary Space Heat	2	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
GR CARE climate zone 3	Primary Space Heat	3	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Natural Gas Appliances (rate is valid if home contains only selected gas appliances)

Conventional Water Heater Spa Heat Auxiliary Space Heating

Solar Water Heat with Gas Backup Pool Heat Dryer

Range Oven Combination Primary Space Heat Miscellaneous Other

All Appliances

Southern California Gas Zone Editor (Only Available for Southern California Gas)

Edit Zone: 1 Store Revised Zone

Period Codes

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2	2	2	2	2	1	1	1	1	2	2	2

Specify a period code between 1 and 4 Store Period Codes

Rate Values

Period 1 Period 2 Period 3 Period 4

Rate information shown for selected period. NaN indicates no rate or maximum at that tier.

	Tier1	Tier2	Tier3	Tier4	Tier5
Maximum daily allowance [therm]	0.473	NaN	NaN	NaN	NaN
Rate [\$ /therm]	0.97914	1.3076	NaN	NaN	NaN

Store Edited Rate Values

Monthly Fixed Charge [\$]

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
5.1	4.6	5.1	4.93	5.1	4.93	5.1	5.1	4.93	5.1	4.93	5.1

Store Edited Monthly Fixed Charges

RESET ALL TO DEFAULT LOAD ALL FROM FILE SAVE ALL TO FILE

Gas Rate Structure Selector and Editor tool initialized at 29-Mar-2018 09:16:24. Select a rate to view and edit.

User can decide which rate is used for each category with check boxes

Natural Gas Rate Structure Editor Tool

Gas Rate Structure Selector and Editor v 1.1

Rate Selector: **Low Income Rates Qualification**

Select Utility: **SOUTHERN CALIFORNIA GAS** [Next Utility] [+ Add Custom Rate]

Select a Rate to View Details: [Previous Utility] [Store Revised Table]

Standard Rates	Low Income Rates	Appliances (use panel to edit -->)	Zone	SingleFamily	MultiFamily	MobileHome
GR climate zone 1	All Appliances		1	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
GR climate zone 2	All Appliances		2	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
GR climate zone 3	All Appliances		3	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
GR climate zone 1	Primary Space Heat		1	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
GR climate zone 2	Primary Space Heat		2	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
GR climate zone 3	Primary Space Heat		3	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
GR climate zone 1	Primary Space Heat		1	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
GR climate zone 2	Primary Space Heat		2	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
GR climate zone 3	Primary Space Heat		3	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
GR all climate zones	Conventional Water Heater, Range Oven Combination, Solar W...		all	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
GR climate zone 1	All Appliances		1	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
GR climate zone 2	All Appliances		2	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
GR climate zone 3	All Appliances		3	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
GR climate zone 1	Primary Space Heat, Range Oven Combination		1	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
GR climate zone 2	Primary Space Heat, Range Oven Combination		2	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
GR climate zone 3	Primary Space Heat, Range Oven Combination		3	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
GR all climate zones	Range Oven Combination		all	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
GR all climate zones	Conventional Water Heater, Solar Water Heat with Gas Backup		all	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
GR climate zone 1	Conventional Water Heater, Primary Space Heat, Solar Water ...		1	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
GR climate zone 2	Conventional Water Heater, Primary Space Heat, Solar Water ...		2	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
GR climate zone 3	Conventional Water Heater, Primary Space Heat, Solar Water ...		3	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
GR CARE climate zone 1	All Appliances		1	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
GR CARE climate zone 2	All Appliances		2	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
GR CARE climate zone 3	All Appliances		3	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
GR CARE climate zone 1	Primary Space Heat		1	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
GR CARE climate zone 2	Primary Space Heat		2	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
GR CARE climate zone 3	Primary Space Heat		3	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

User can edit/specify geographical zones for SoCalGas

Natural Gas Appliances (rate is valid if home contains only selected gas appliances)

Conventional Water Heater Spa Heat Auxiliary Space Heating

Solar Water Heat with Gas Backup Pool Heat Dryer

Range Oven Combination Primary Space Heat Miscellaneous Other

All Appliances

Southern California Gas Zone Editor (Only Available for Southern California Gas)

Edit Zone: **1** [Store Revised Zone]

Period Codes

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2	2	2	2	2	1	1	1	1	2	2	2

Specify a period code between 1 and 4 [Store Period Codes]

Rate Values

Period 1 | **Period 2** | Period 3 | Period 4

Rate information shown for selected period. NaN indicates no rate or maximum at that tier.

	Tier1	Tier2	Tier3	Tier4	Tier5
Maximum daily allowance [therm]	0.473	NaN	NaN	NaN	NaN
Rate [\$/therm]	0.97914	1.3076	NaN	NaN	NaN

[Store Edited Rate Values]

Monthly Fixed Charge [\$]

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
5.1	4.6	5.1	4.93	5.1	4.93	5.1	5.1	4.93	5.1	4.93	5.1

[Store Edited Monthly Fixed Charges]

[RESET ALL TO DEFAULT] [LOAD ALL FROM FILE] [SAVE ALL TO FILE]

Gas Rate Structure Selector and Editor tool initialized at 29-Mar-2018 09:16:24. Select a rate to view and edit.



Natural Gas Rate Structure Editor Tool

Gas Rate Structure Selector and Editor v 1.1

Rate Selector: Low Income Rates Qualification

Select Utility: SOUTHERN CALIFORNIA GAS

Select a Rate to View Details:

Standard Rates	Low Income Rates	Zone	SingleFamily	MultiFamily	MobileHome
GR climate zone 1	All Appliances	1	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
GR climate zone 2	All Appliances	2	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
GR climate zone 3	All Appliances	3	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
GR climate zone 1	Primary Space Heat	1	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
GR climate zone 2	Primary Space Heat	2	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
GR climate zone 3	Primary Space Heat	3	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
GR climate zone 1	Primary Space Heat	1	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
GR climate zone 2	Primary Space Heat	2	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
GR climate zone 3	Primary Space Heat	3	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
GR all climate zones	Conventional Water Heater, Range Oven Combination, Solar W...	all	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
GR climate zone 1	All Appliances	1	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
GR climate zone 2	All Appliances	2	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
GR climate zone 3	All Appliances	3	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
GR climate zone 1	Primary Space Heat, Range Oven Combination	1	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
GR climate zone 2	Primary Space Heat, Range Oven Combination	2	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
GR climate zone 3	Primary Space Heat, Range Oven Combination	3	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
GR all climate zones	Range Oven Combination	all	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
GR all climate zones	Conventional Water Heater, Solar Water Heat with Gas Backup	all	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
GR climate zone 1	Conventional Water Heater, Primary Space Heat, Solar Water ...	1	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
GR climate zone 2	Conventional Water Heater, Primary Space Heat, Solar Water ...	2	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
GR climate zone 3	Conventional Water Heater, Primary Space Heat, Solar Water ...	3	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
GR CARE climate zone 1	All Appliances	1	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
GR CARE climate zone 2	All Appliances	2	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
GR CARE climate zone 3	All Appliances	3	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
GR CARE climate zone 1	Primary Space Heat	1	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
GR CARE climate zone 2	Primary Space Heat	2	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
GR CARE climate zone 3	Primary Space Heat	3	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Natural Gas Appliances (rate is valid if home contains only selected gas appliances)

Conventional Water Heater Spa Heat Auxiliary Space Heating

Solar Water Heat with Gas Backup Pool Heat Dryer

Range Oven Combination Primary Space Heat Miscellaneous Other

All Appliances

Southern California Gas Zone Editor (Only Available for Southern California Gas)

Edit Zone: 1 Store Revised Zone

Period Codes

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2	2	2	2	2	1	1	1	1	2	2	2

Specify a period code between 1 and 4 Store Period Codes

Rate Values

Period 1 Period 2 Period 3 Period 4

Rate information shown for selected period. NaN indicates no rate or maximum at that tier.

	Tier1	Tier2	Tier3	Tier4	Tier5
Maximum daily allowance [therm]	0.473	NaN	NaN	NaN	NaN
Rate [\$ /therm]	0.97914	1.3076	NaN	NaN	NaN

Store Edited Rate Values

Monthly Fixed Charge [\$]

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
5.1	4.6	5.1	4.93	5.1	4.93	5.1	5.1	4.93	5.1	4.93	5.1

Store Edited Monthly Fixed Charges

RESET ALL TO DEFAULT LOAD ALL FROM FILE SAVE ALL TO FILE

Gas Rate Structure Selector and Editor tool initialized at 29-Mar-2018 09:16:24. Select a rate to view and edit.

Ability to edit rates and tiers for each period. Monthly fixed charges also included

Natural Gas Rate Structure Editor Tool

Gas Rate Structure Selector and Editor v 1.1

Rate Selector: Low Income Rates Qualification

Select Utility: SOUTHERN CALIFORNIA GAS

Select a Rate to View Details:

Rate	Appliances (use panel to edit -->)	Zone	SingleFamily	MultiFamily	MobileHome
GR climate zone 1	All Appliances	1	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
GR climate zone 2	All Appliances	2	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
GR climate zone 3	All Appliances	3	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
GR climate zone 1	Primary Space Heat	1	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
GR climate zone 2	Primary Space Heat	2	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
GR climate zone 3	Primary Space Heat	3	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
GR climate zone 1	Primary Space Heat	1	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
GR climate zone 2	Primary Space Heat	2	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
GR climate zone 3	Primary Space Heat	3	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
GR all climate zones	Conventional Water Heater, Range Oven Combination, Solar W...	all	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
GR climate zone 1	All Appliances	1	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
GR climate zone 2	All Appliances	2	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
GR climate zone 3	All Appliances	3	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
GR climate zone 1	Primary Space Heat, Range Oven Combination	1	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
GR climate zone 2	Primary Space Heat, Range Oven Combination	2	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
GR climate zone 3	Primary Space Heat, Range Oven Combination	3	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
GR all climate zones	Range Oven Combination	all	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
GR all climate zones	Conventional Water Heater, Solar Water Heat with Gas Backup	all	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
GR climate zone 1	Conventional Water Heater, Primary Space Heat, Solar Water ...	1	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
GR climate zone 2	Conventional Water Heater, Primary Space Heat, Solar Water ...	2	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
GR climate zone 3	Conventional Water Heater, Primary Space Heat, Solar Water ...	3	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
GR CARE climate zone 1	All Appliances	1	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
GR CARE climate zone 2	All Appliances	2	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
GR CARE climate zone 3	All Appliances	3	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
GR CARE climate zone 1	Primary Space Heat	1	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
GR CARE climate zone 2	Primary Space Heat	2	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
GR CARE climate zone 3	Primary Space Heat	3	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Natural Gas Appliances (rate is valid if home contains only selected gas appliances)

Conventional Water Heater Spa Heat Auxiliary Space Heating

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All Appliances

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Edit Zone: 1 Store Revised Zone

Period Codes

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
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Specify a period code between 1 and 4 Store Period Codes

Rate Values

Period 1 Period 2 Period 3 Period 4

Rate information shown for selected period. NaN indicates no rate or maximum at that tier.

	Tier1	Tier2	Tier3	Tier4	Tier5
Maximum daily allowance [therm]	0.473	NaN	NaN	NaN	NaN
Rate [\$/therm]	0.97914	1.3076	NaN	NaN	NaN

Store Edited Rate Values

Monthly Fixed Charge (\$)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
5.1	5.1	5.1	5.1	4.93	4.93	4.93	5.1	4.93	5.1	4.93	5.1

Store Edited Monthly Fixed Charges

RESET ALL TO DEFAULT **LOAD ALL FROM FILE** **SAVE ALL TO FILE**

Gas Rate Structure Selector and Editor tool initialized at 29-Mar-2018 09:16:24. Select a rate to view and edit.

Comprehensive input and output tools so that revised rates can be used in NEAT directly



Natural Gas Rate Structure Editor Tool

Gas Rate Structure Selector and Editor v 1.1

Rate Selector Low Income Rates Qualification

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, welfare income, food stamp reciprocity, disability status, and veteran status, and military 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 analyzed. 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 repopulate the table with the default values and then use the "Store All and Close" button to store the default values in memory. Any edits to the table must also be stored with the "Store All and Close" button.

Rate Type	Electric Utility	Rate Type	Gas Utility	SINGLE FAMILY HOMES [%]						MULTI FAMILY HOMES [%]						MOBILE HOMES [%]					
				CZ 6	CZ 8	CZ 9	CZ 10	CZ 15	CZ 16	CZ 6	CZ 8	CZ 9	CZ 10	CZ 15	CZ 16	CZ 6	CZ 8	CZ 9	CZ 10	CZ 15	CZ 16
high	Azusa Light & Power	high	CITY OF VERNON GAS SYSTEM	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
high	Azusa Light & Power	high	LONG BEACH GAS & OIL	92.23	81.35	84.33	80.77	83.66	85.55	82.06	62.99	68.17	58.99	55.95	64.76	72.66	65.56	61.48	65.35	65.98	75.65
high	Azusa Light & Power	low	LONG BEACH GAS & OIL	7.77	18.65	15.67	19.23	16.34	14.45	17.94	37.01	31.83	41.01	44.05	35.24	27.34	34.44	38.52	34.65	34.02	24.35
high	Azusa Light & Power	high	SOUTHERN CALIFORNIA GAS	92.14	81.07	84.09	80.58	83.47	85.03	82	62.77	67.89	58.42	55.95	64.24	72.14	64.31	60.81	64.85	65.7	74.8
high	Azusa Light & Power	low	SOUTHERN CALIFORNIA GAS	7.86	18.93	15.91	19.42	16.53	14.97	18	37.23	32.11	41.58	44.05	35.76	27.86	35.69	39.19	35.15	34.3	25.2
high	Azusa Light & Power	high	SOUTHWEST GAS CORP.	83.95	73.44	75.43	73.36	62.1	70.59	66.4	49.79	53.92	45.57	34.15	42.96	52.25	47.16	43.49	40.52	32.92	43.54
high	Azusa Light & Power	low	SOUTHWEST GAS CORP.	16.05	26.56	24.57	26.0												59.48	67.08	56.46
high	Bear Valley Electric Service	high	CITY OF VERNON GAS SYSTEM	83.95	73.44	75.43	73.36												40.52	32.92	43.54
low	Bear Valley Electric Service	high	CITY OF VERNON GAS SYSTEM	16.05	26.56	24.57	26.0												59.48	67.08	56.46
high	Bear Valley Electric Service	high	LONG BEACH GAS & OIL	83.95	73.44	75.43	73.36												40.52	32.92	43.54
low	Bear Valley Electric Service	high	LONG BEACH GAS & OIL	8.29	7.91	8.9	7.7												24.83	33.06	32.11
low	Bear Valley Electric Service	low	LONG BEACH GAS & OIL	7.77	18.65	15.67	19.23												34.65	34.02	24.35
high	Bear Valley Electric Service	high	SOUTHERN CALIFORNIA GAS	83.95	73.44	75.43	73.36												40.52	32.92	43.54
low	Bear Valley Electric Service	high	SOUTHERN CALIFORNIA GAS	8.19	7.63	8.66	7.7												24.33	32.79	31.26
low	Bear Valley Electric Service	low	SOUTHERN CALIFORNIA GAS	7.86	18.93	15.91	19.42												35.15	34.3	25.2
high	Bear Valley Electric Service	high	SOUTHWEST GAS CORP.	83.95	73.44	75.43	73.36												40.52	32.92	43.54
low	Bear Valley Electric Service	low	SOUTHWEST GAS CORP.	16.05	26.56	24.57	26.0												59.48	67.08	56.46
high	Burbank Water & Power	high	CITY OF VERNON GAS SYSTEM	90.18	88.05	87.16	87.1												62.34	59.41	58.71
low	Burbank Water & Power	high	CITY OF VERNON GAS SYSTEM	9.82	11.95	12.84	12.9												37.66	40.59	41.29
high	Burbank Water & Power	high	LONG BEACH GAS & OIL	85.62	76.03	78.12	75.46	71.28	73.53	74.62	57.79	62.67	52.93	41.63	53.57	55.36	50.49	47.4	44.45	39.85	48.49
high	Burbank Water & Power	low	LONG BEACH GAS & OIL	4.56	12.02	9.04	12.14	9.94	7.9	10.65	23.45	17.82	25.46	31.35	21.72	8.79	22.78	17.27	17.89	19.56	10.22
low	Burbank Water & Power	high	LONG BEACH GAS & OIL	6.62	5.32	6.2	5.31	12.39	12.01	7.45	5.2	5.5	6.06	14.32	11.18	17.3	15.07	14.08	20.9	26.13	27.17

Ability to modify fraction of homes in each electric/gas utility combination that are eligible for low income rates. Identical module added to the Electric Rate Structure Editor Tool

IPUMS Data Source: Steven Ruggles, Katie Genadek, Ronald Goeken, Josiah Grover, and Matthew Sobek. Integrated Public Use Microdata Series: Version 7.0 [dataset]. Minneapolis, MN: University of Minnesota, 2017. <https://doi.org/10.18128/D010.V7.0>

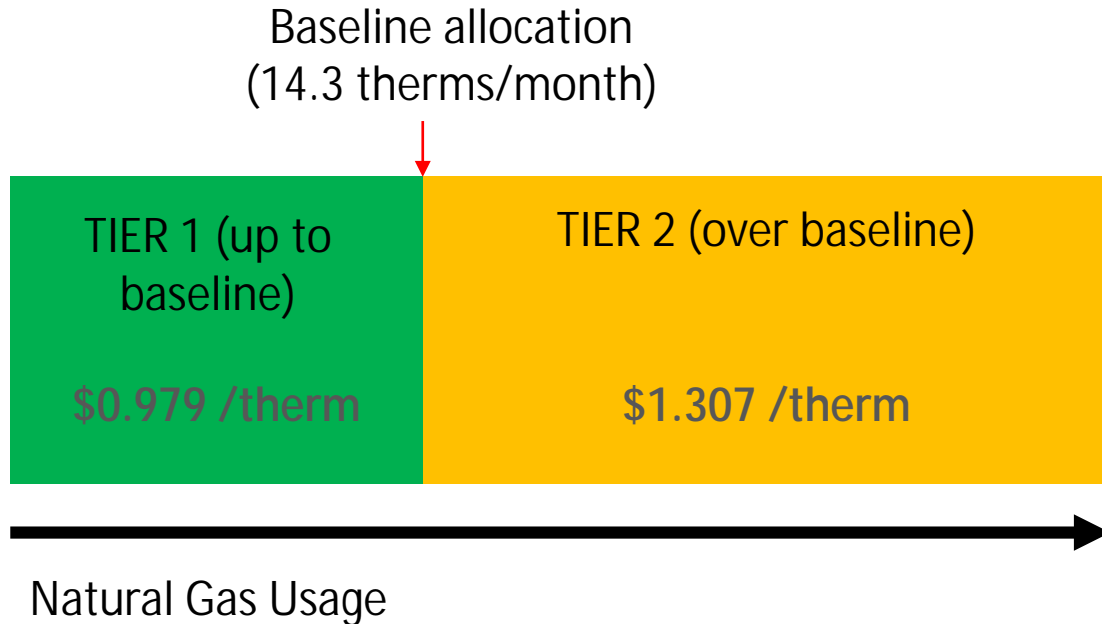
Load Default Values

Store All and Close



Calculation of Natural Gas Rates

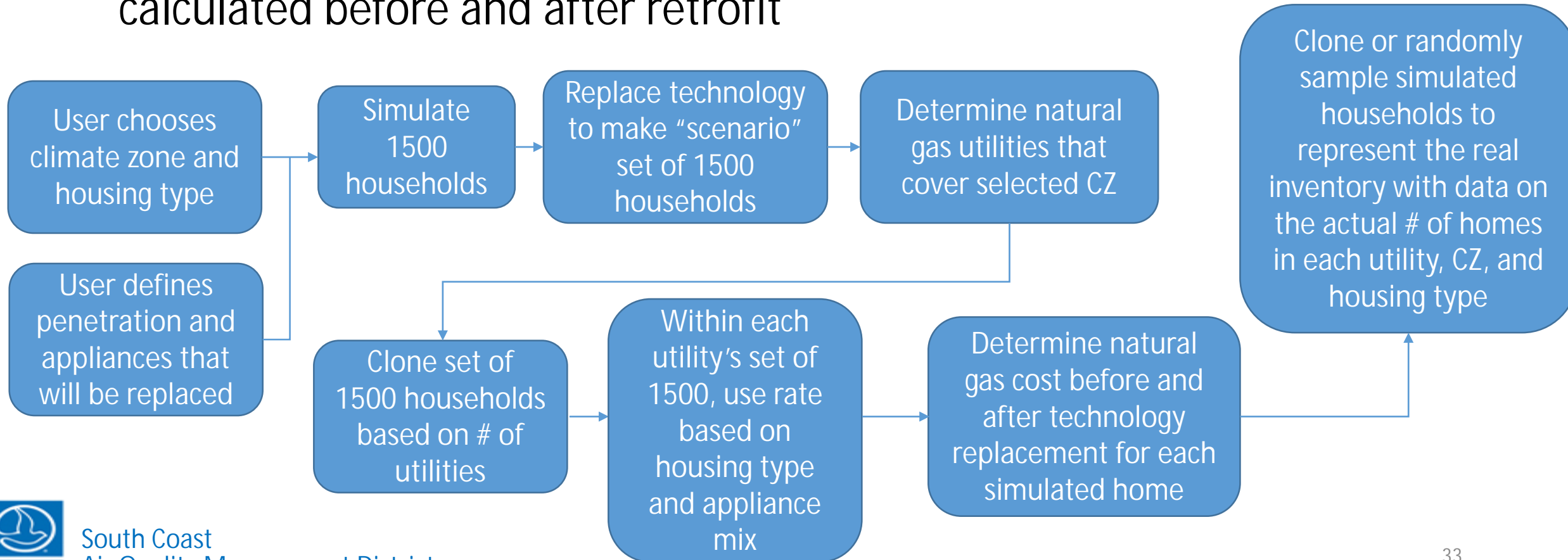
Each period code (assigned monthly) has a set of tiers with a Maximum monthly usage and a corresponding rate:



- Monthly usage is allocated between the tiers and multiplied by the rate of each tier to generate a monthly variable natural gas charge
- Monthly fixed charges are added

Calculation of Natural Gas Rates

- For each of the 1500 simulated homes, natural gas costs must be calculated before and after retrofit



Updates to Electricity Generation Emissions

Marc Carreras-Sospedra Ph.D.

Planning, Rule Development, and Area Sources Division



Electricity Generation Emission Factor Options

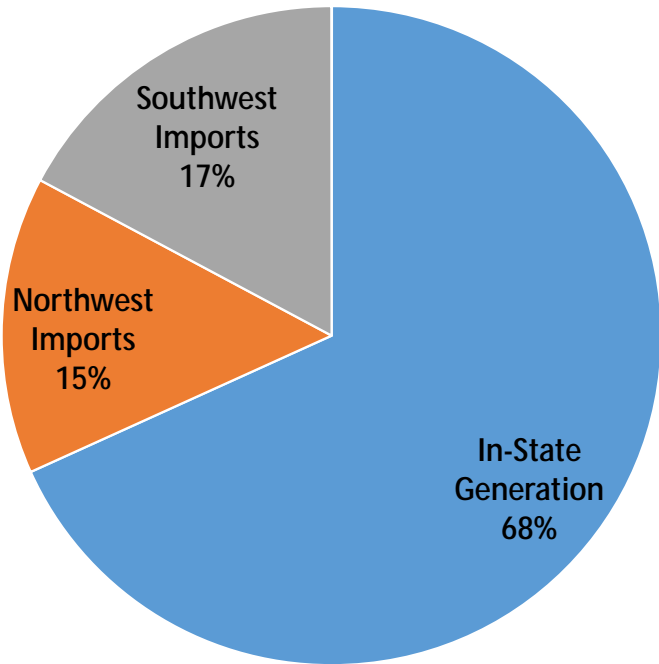
Electricity Generation

Emission Factor of INCREASED Electricity Use	Emission Factor of REDUCED Electricity Use
<input type="radio"/> All additional electricity from centralized photovoltaics	<input checked="" type="radio"/> Reductions in electricity generation emissions determined with the average grid emission factor
<input checked="" type="radio"/> All additional electricity provided at the average grid emission factor	<input type="radio"/> Reductions in electricity generation emissions arise by curtailing peaker plant emissions
<input type="radio"/> All additional electricity provided by peaker plants	<input type="radio"/> Grid emission factor changes modeled with HiGRID
<input type="radio"/> Grid emission factor changes modeled with HiGRID	

[Electricity Generation Module Documentation](#)

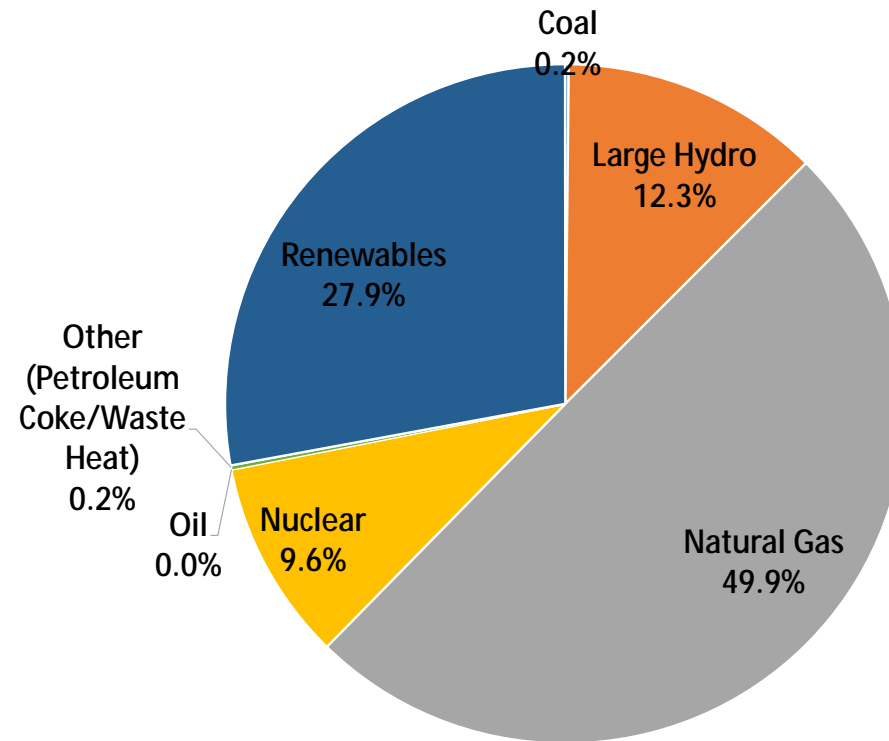
Electricity Generation in California

Imports of Electricity

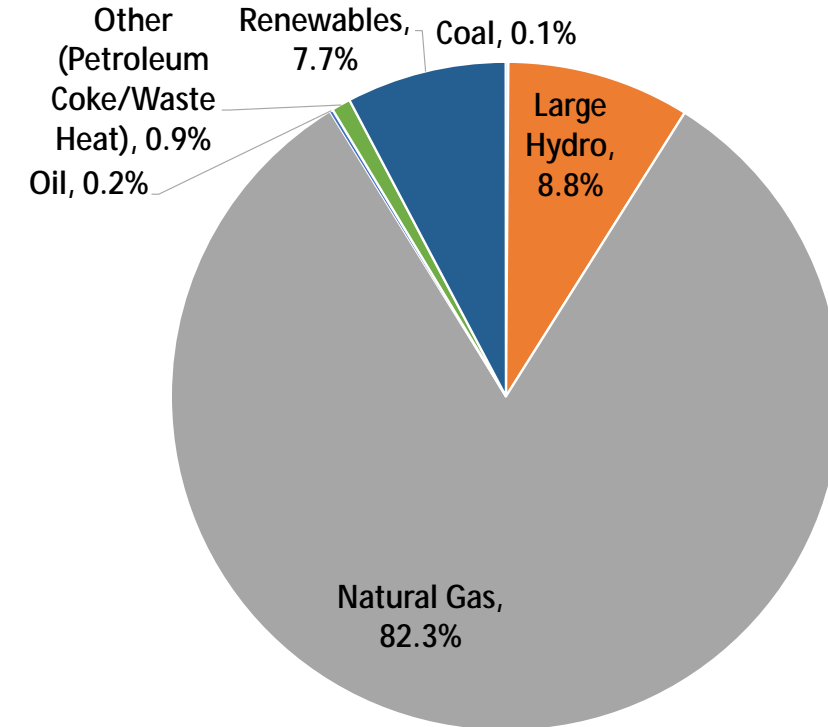


From CEC, 2016 Total System Electric Generation

In-state Electricity Generation



Electricity Generation within SCAQMD



From eGRID 2014



Emissions from Average Grid

- We assume changes in electricity will be met by the marginal grid
- For California, we assume marginal electricity is generated from dispatchable units, which are NG units
- Hourly load and emissions are obtained from the Continuous Emissions Monitoring system (Air Markets Program Data, <https://ampd.epa.gov/ampd/>)



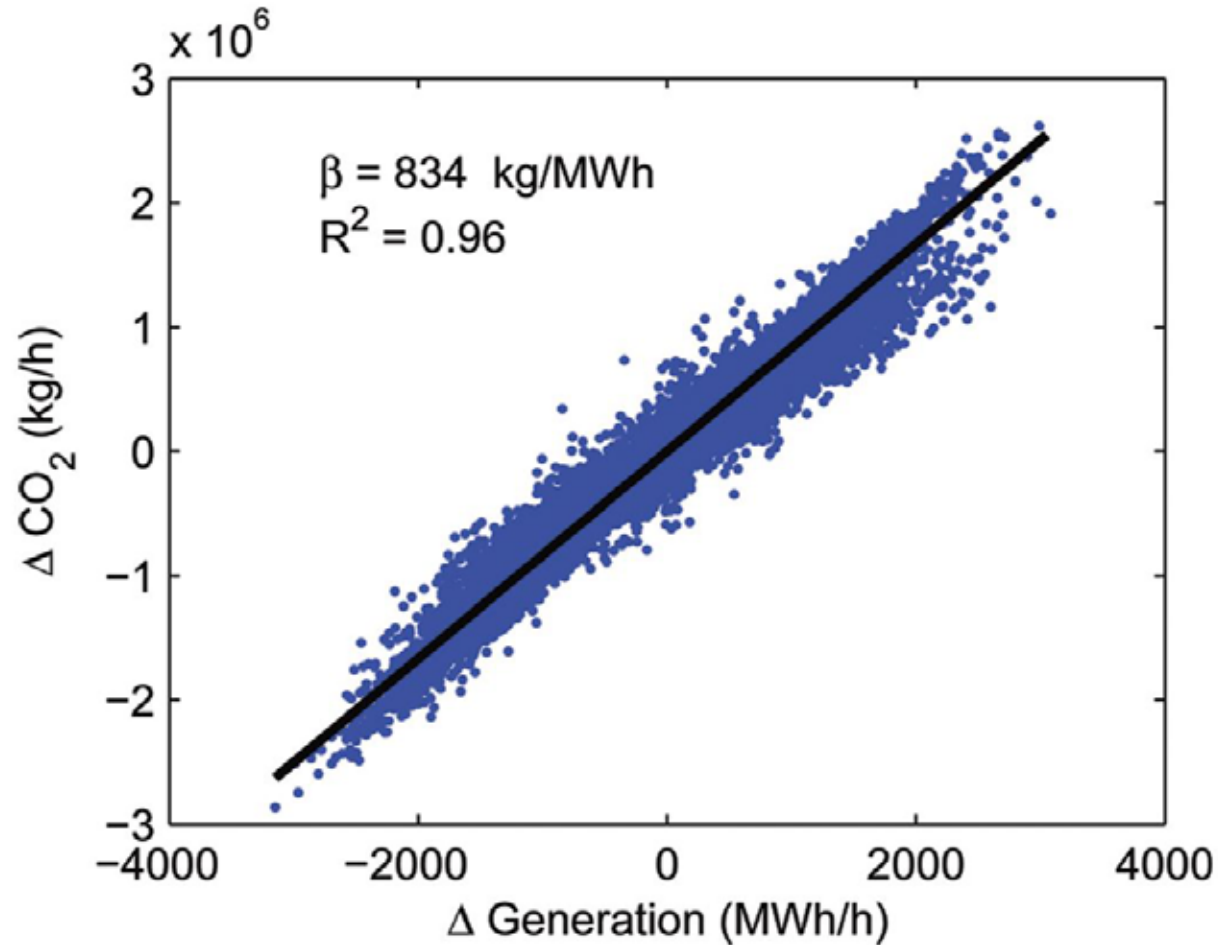
Power Plant Data Availability

- Data availability for hourly emissions and throughput data:
 - Used hourly data from 2011 to 2017
 - NO_x and CO_2 emissions are used to calculate marginal emissions
 - Hourly marginal values are calculated for four representative days:
 - Winter weekday, winter weekend day, summer weekday and summer weekend day

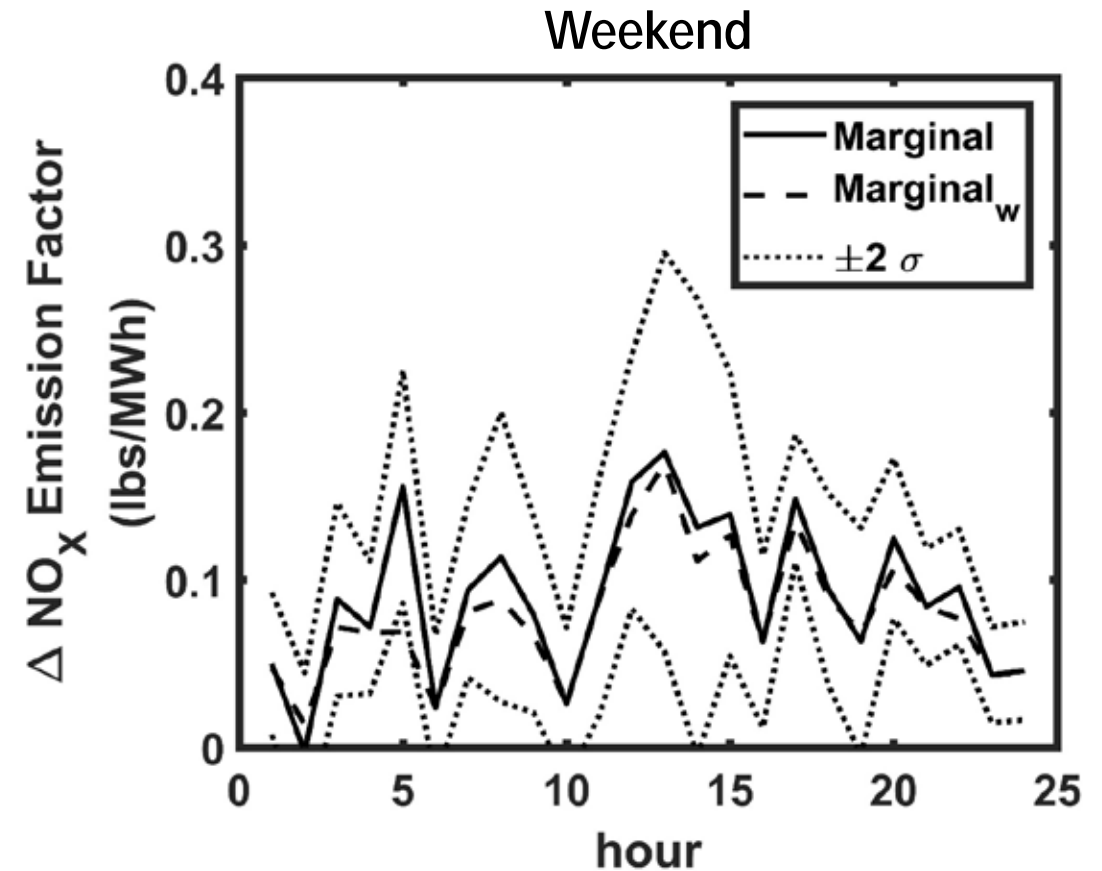
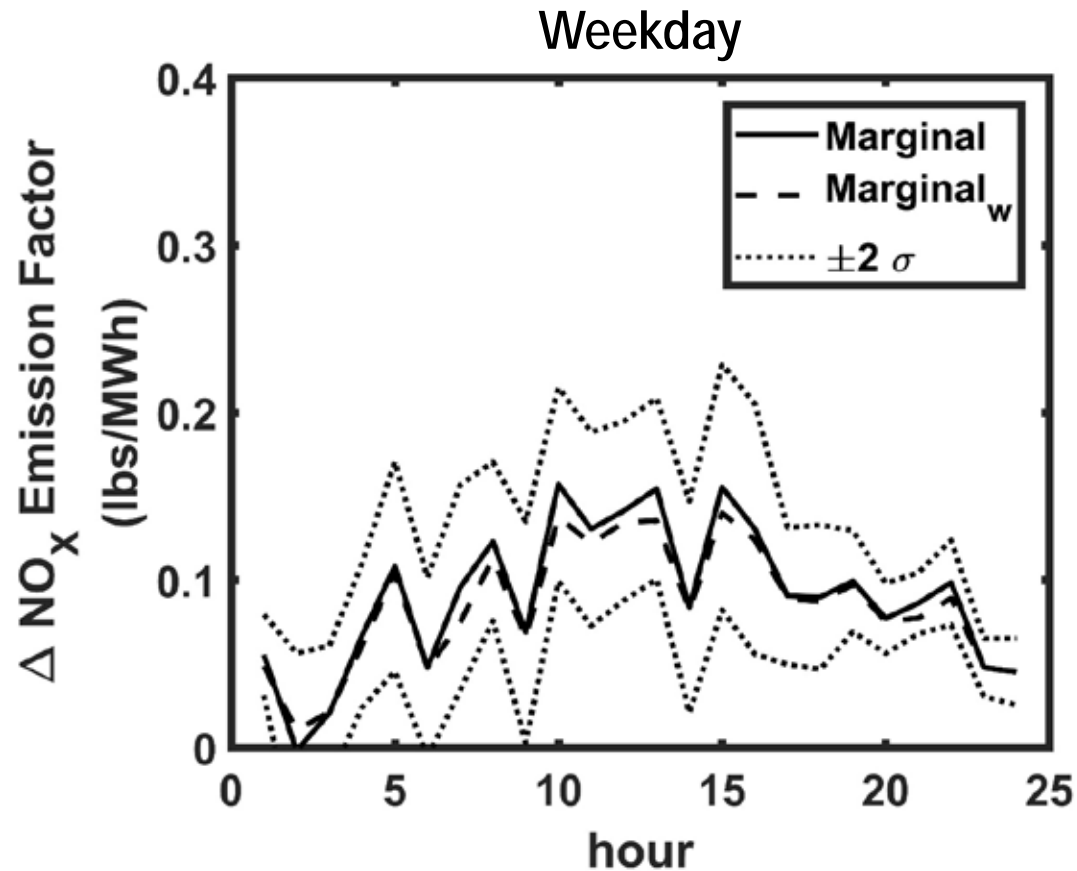


Methodology for Marginal Emissions

Methodology based on peer-reviewed work (Siler-Evans et al., 2012)



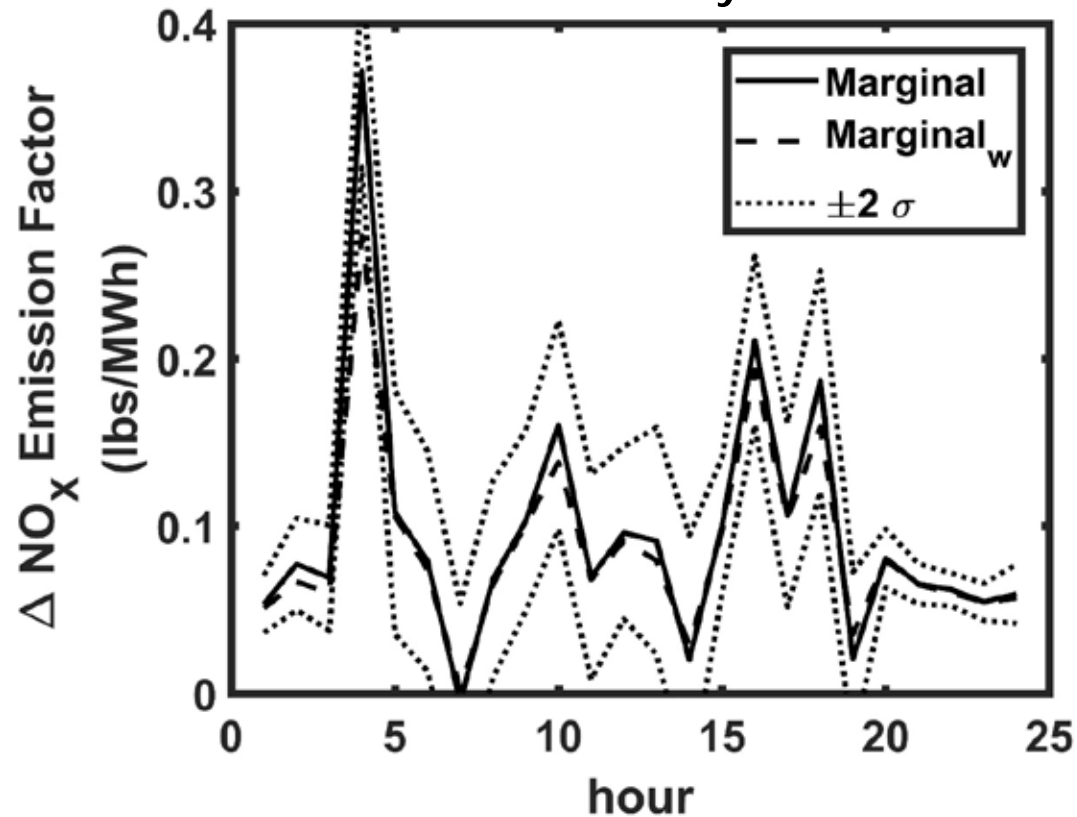
Summer Marginal Emission Factors for NO_x



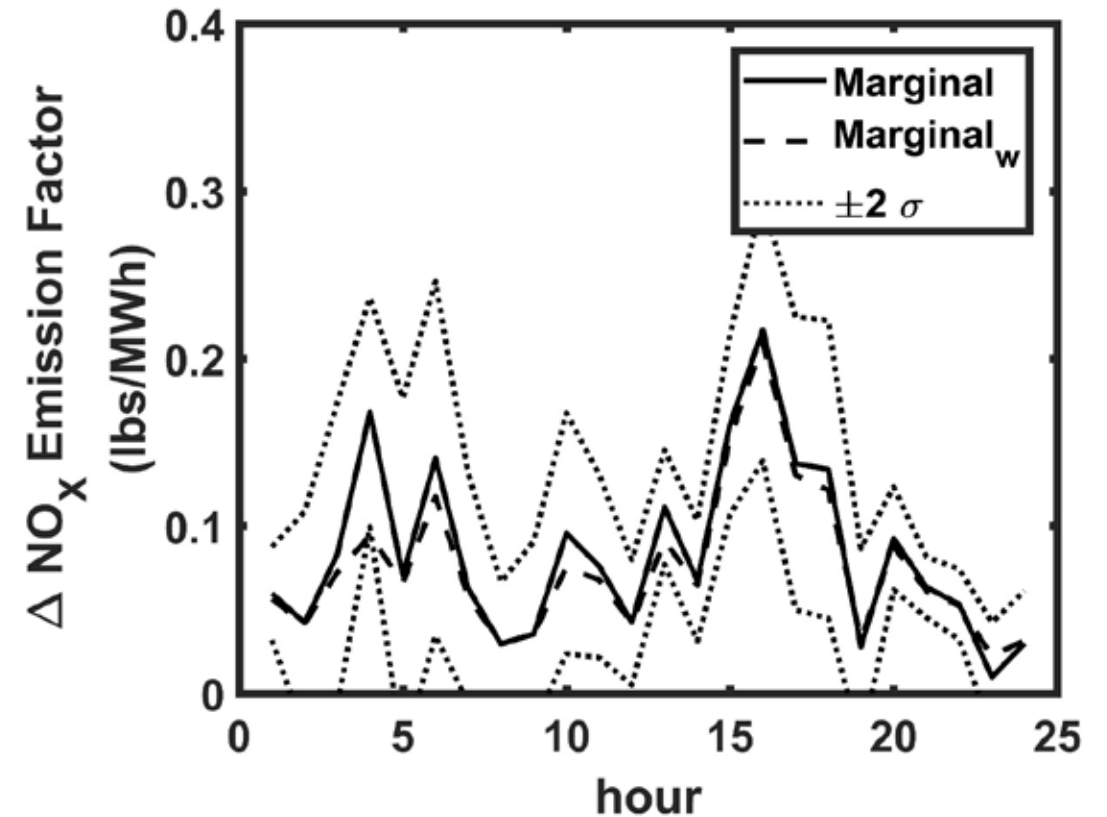
For NO_x, we calculated marginal emissions using a linear regression (Marginal) and a weighted linear regression (Marginal_w) to trim out outliers

Winter Marginal Emission Factors for NO_x

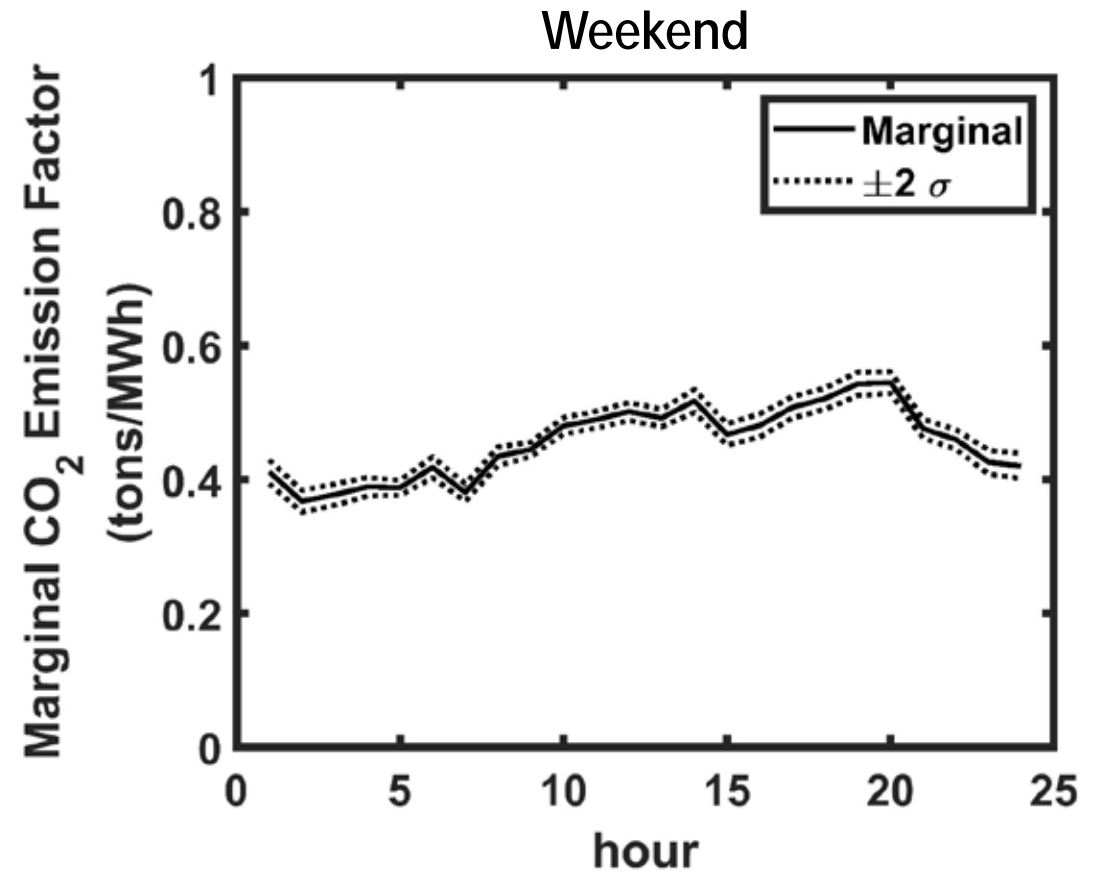
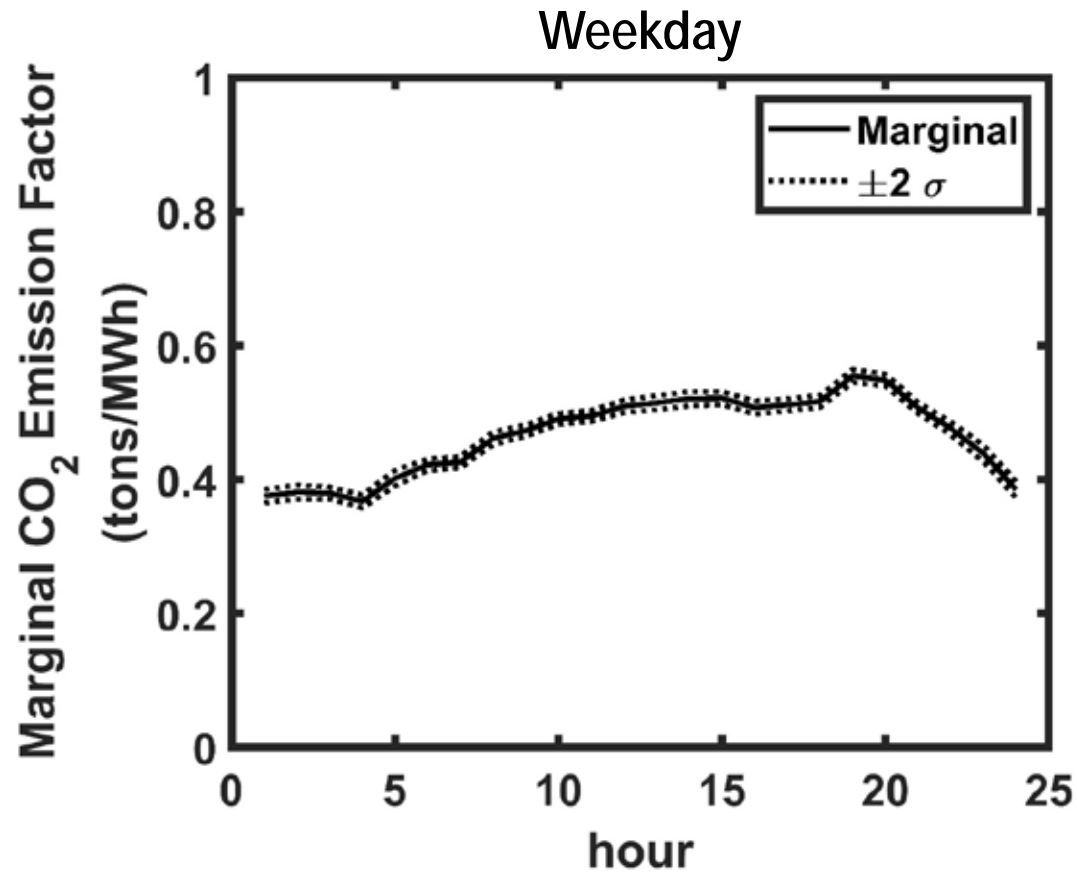
Weekday



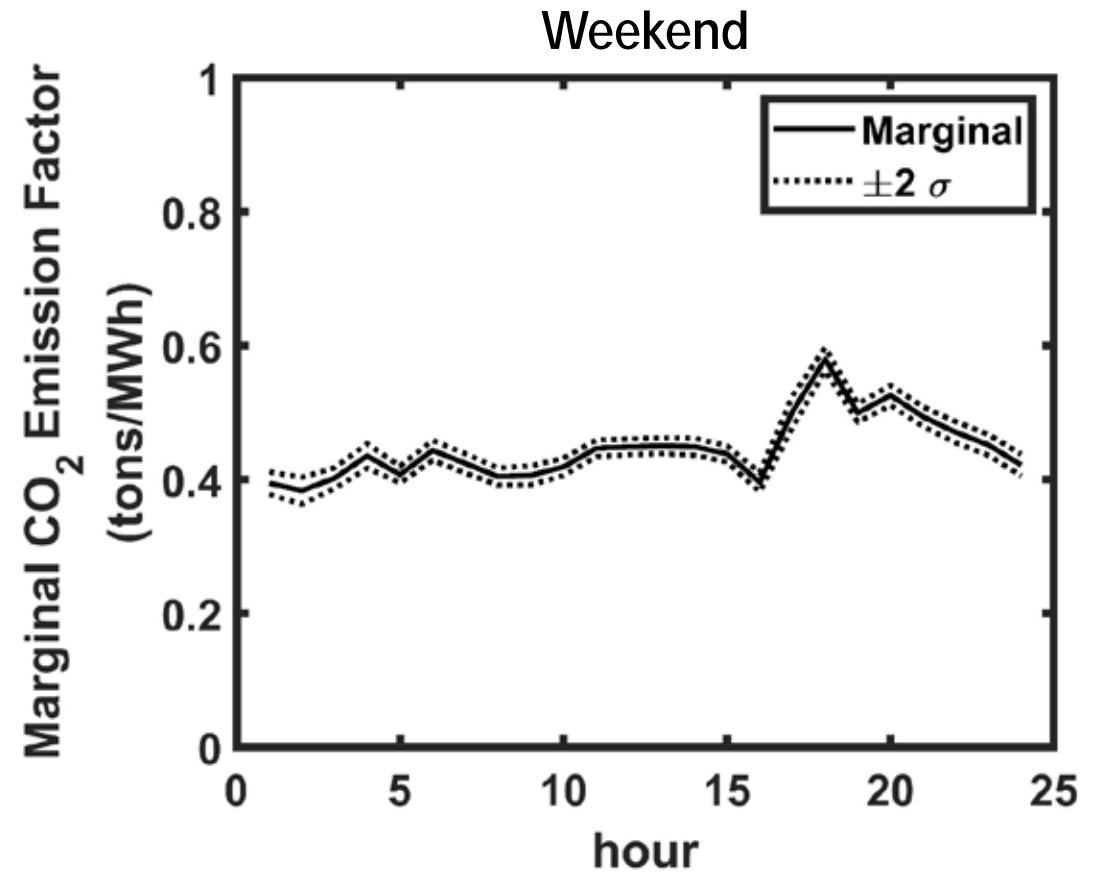
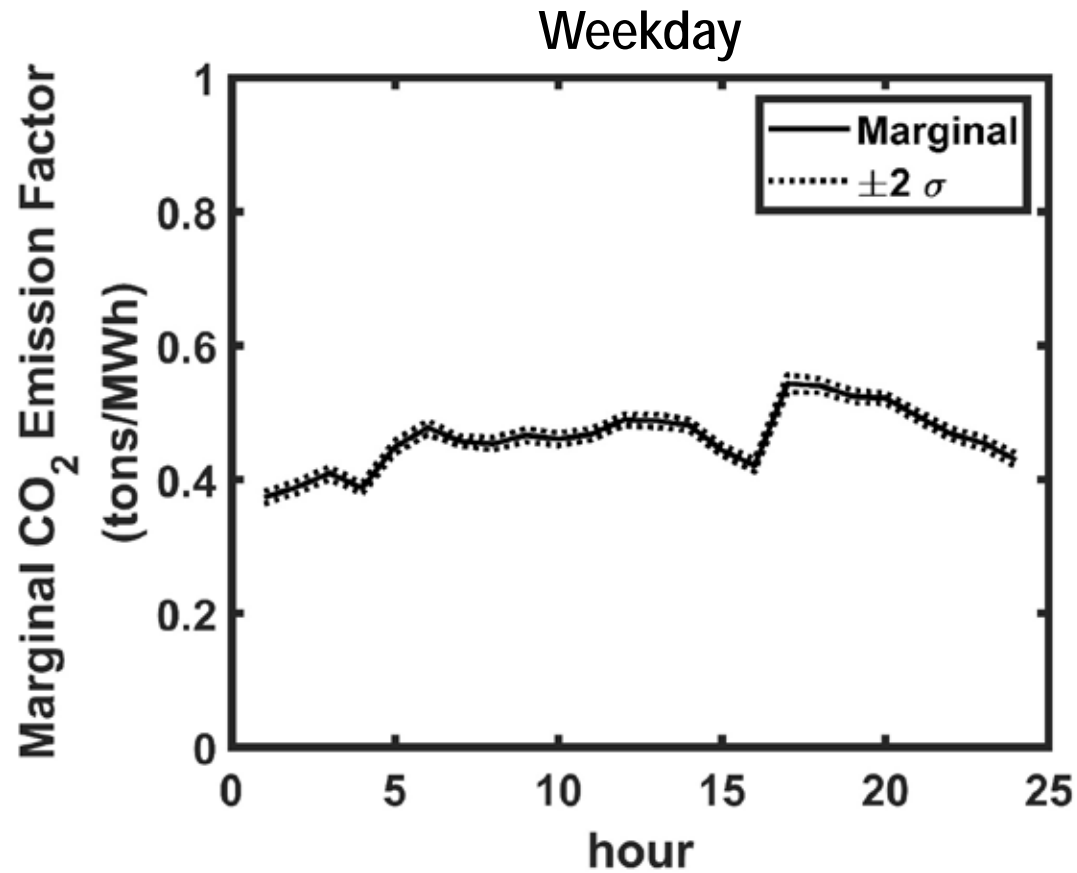
Weekend



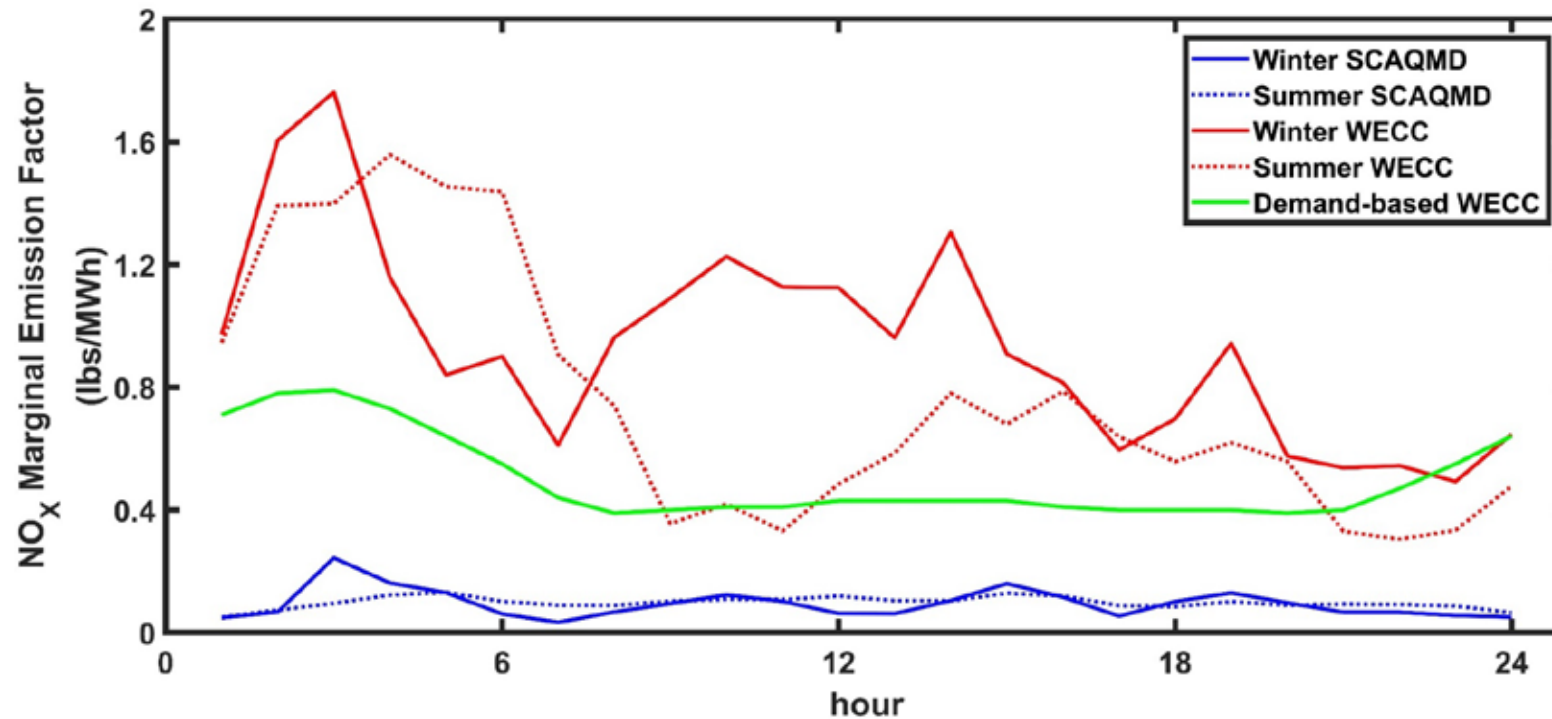
Summer Marginal Emission Factors for CO₂



Winter Marginal Emission Factors for CO₂



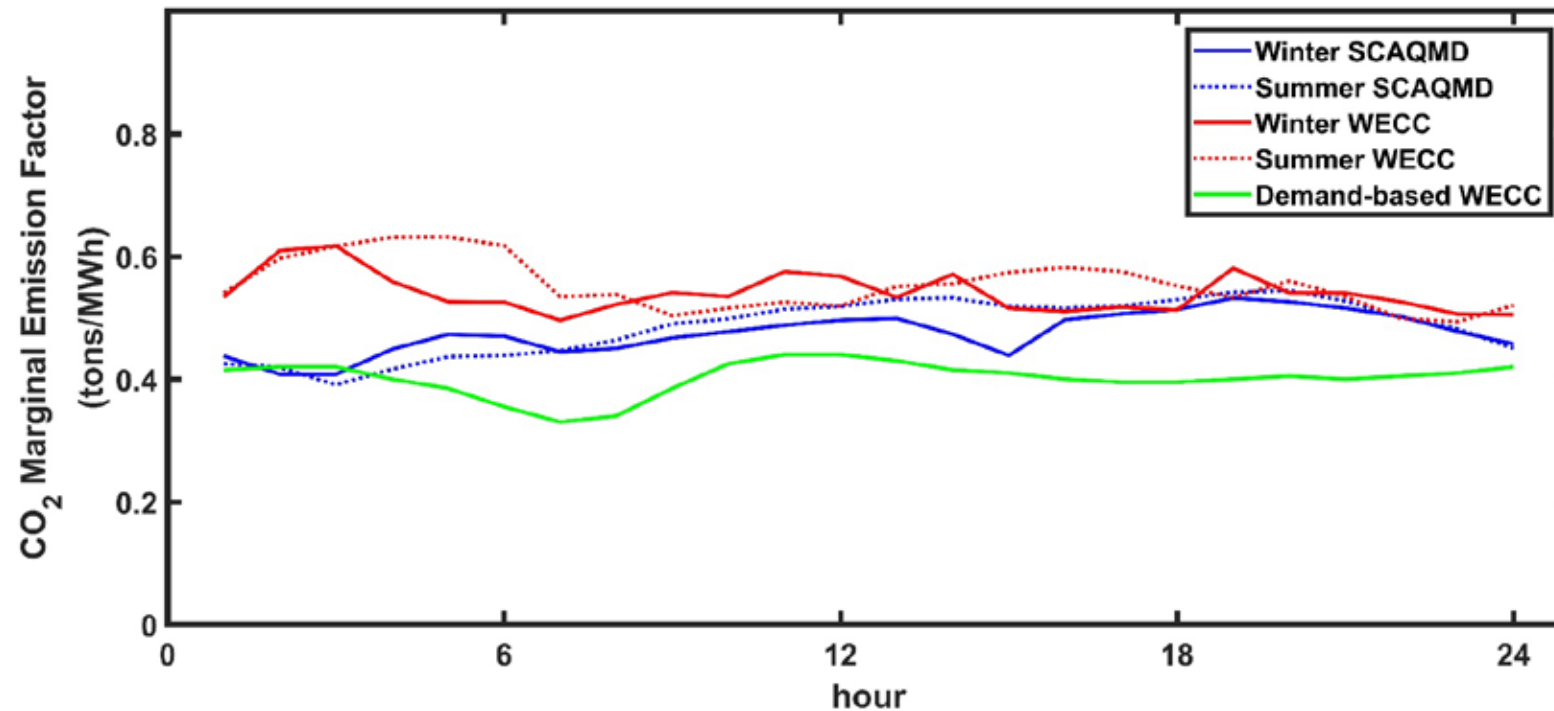
Comparison of Marginal EFs with Other Studies



Other analyses found higher emission values for the grid mix, because they considered the entire western interconnect (WECC), which includes coal generation and less restrictive emission limits:

- Siler-Evans et al., (2012) calculated EF based on hourly power generation in WECC
- Watt-time calculated EF based on hourly demand in WECC, which implicitly includes renewables

Comparison of Marginal EFs with Other Studies

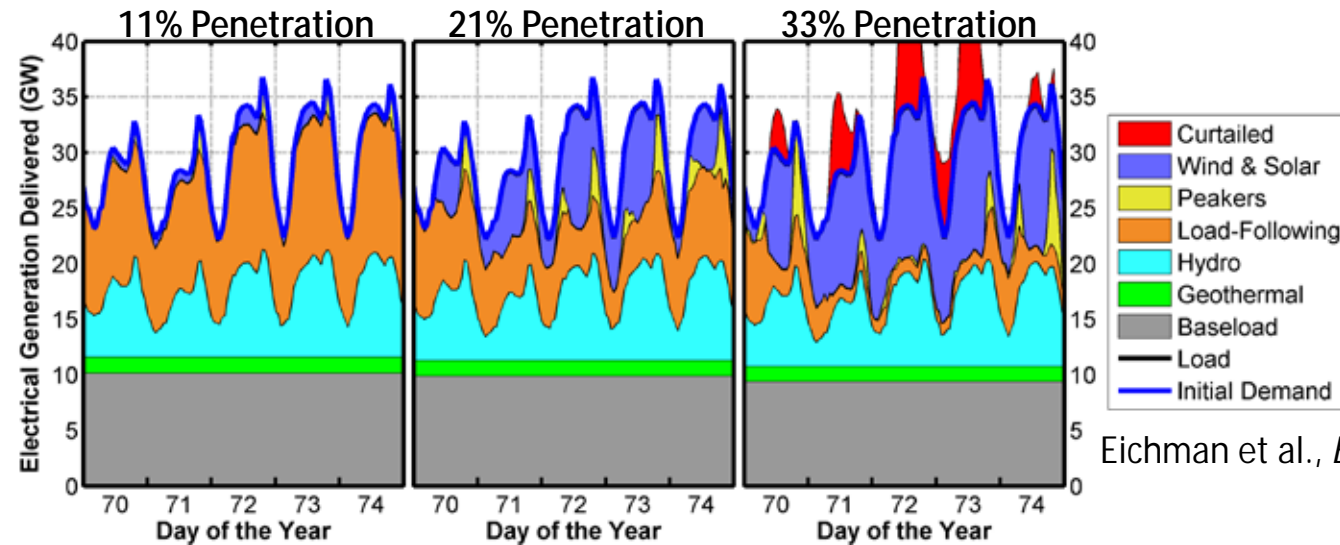


Differences in CO₂ estimates among studies are narrower:

- WECC CO₂ marginal emissions based on power generation are generally higher than in California due to coal
- Watt-time calculated EF tend to be lower than for California, because demand-based marginal emissions intrinsically include renewables

Advanced Grid Emissions Modeling

- UC Irvine developing the Holistic Grid Resource Integration and Deployment (HiGRID) Model, to be integrated with NEAT
 - Used originally to analyze the impacts of renewable integration



Eichman et al., *Energy*, 50, 353-363, 2013.

- HiGRID is a comprehensive model
 - Uses algorithms that mimic the electric market
 - Determines temporal profile of load-following and peaking power plants
 - Accounts for limitations due to ramping rates, spinning reserves and frequency regulation on a capacity basis

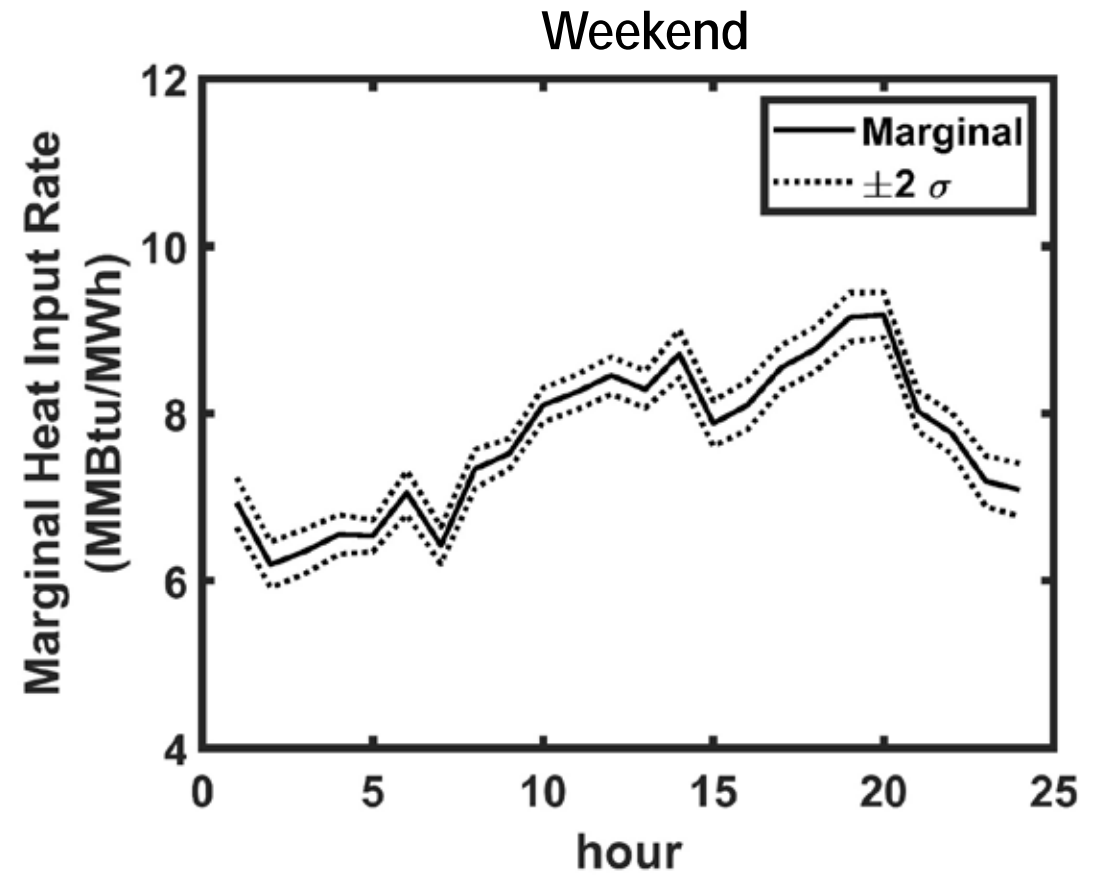
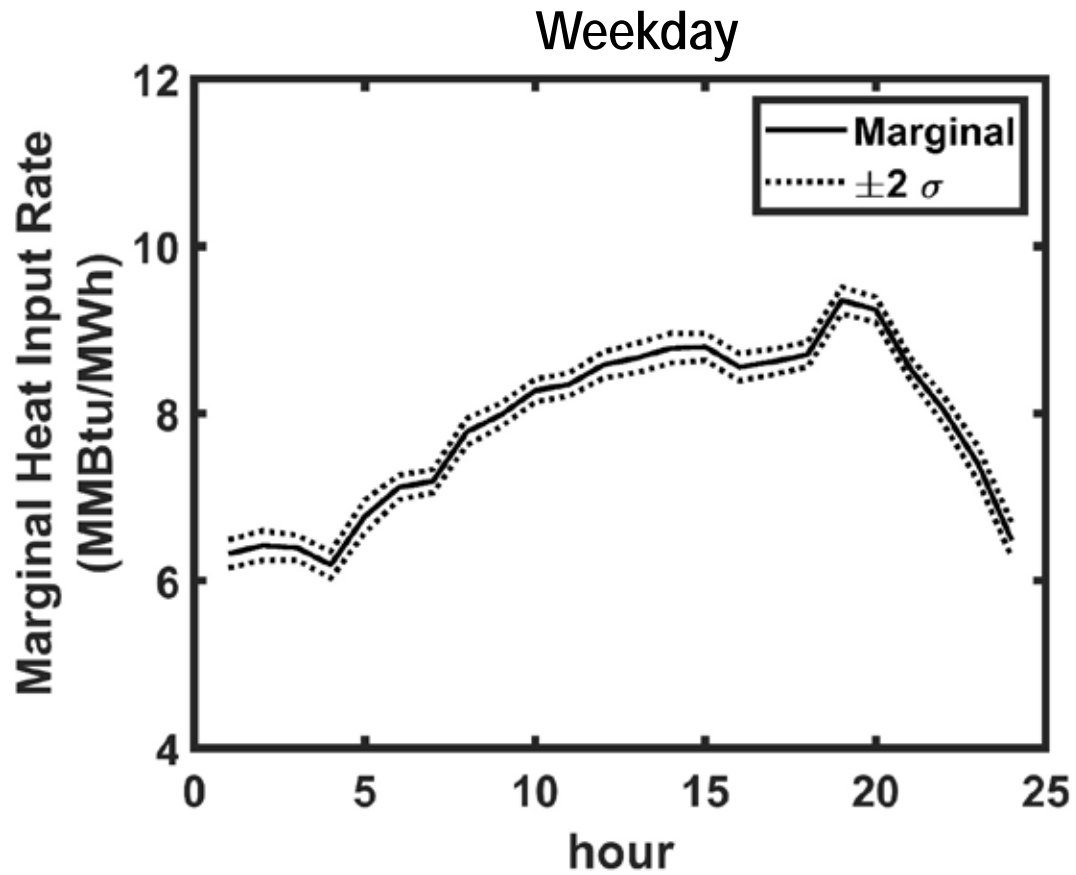
Natural Gas Consumption from Electricity Generation

Marc Carreras-Sospedra Ph.D.

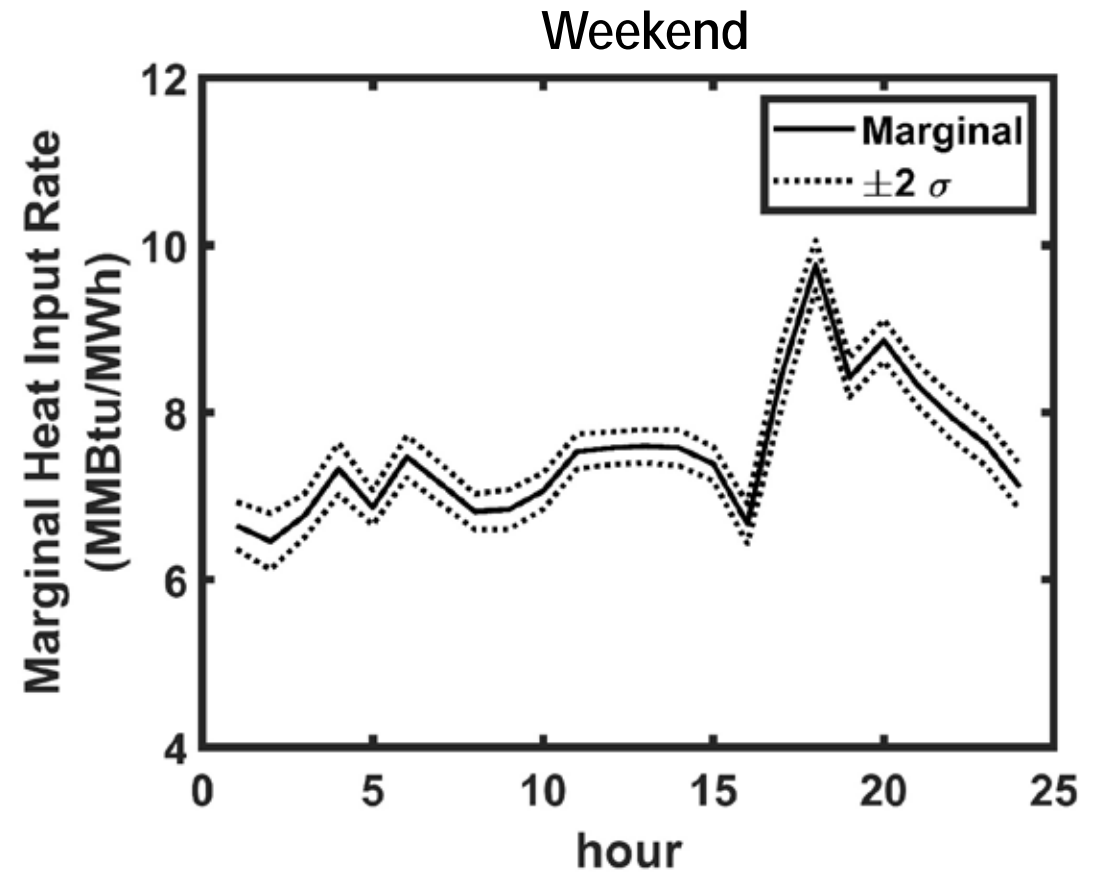
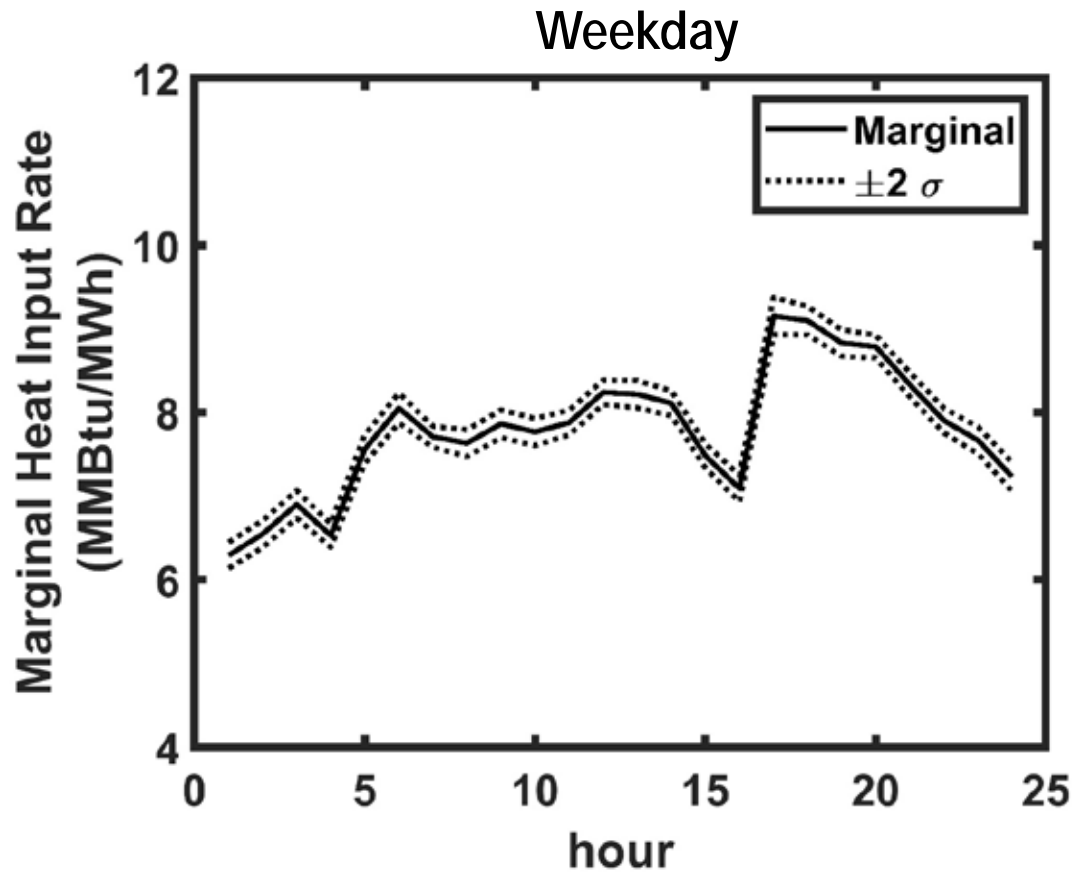
Planning, Rule Development, and Area Sources Division



Summer Marginal Heat Input Rate



Winter Marginal Heat Input Rate



Marginal heat input rate will be used to calculate changes in NG consumption due to changes in electricity demand, which may affect total NG leaks

Public Comment



blog.cleanenergy.org

Next Steps

Residential NEAT	Not Yet Started	In Progress	Draft Complete	WG meeting #
Building of tool framework (GUI, file I/O)			X	2
Collection of input data			X	2
Demand segment of tool			X	2, 3
Implementation of distributed solar			X	2
Implementation of distributed battery storage		X		Future
Electric Rate Calculator			X	3
Natural Gas Rate Calculator			X	4
Implementation of net metering			X	3
Solar and battery cost calculator			X	Future
Electric generation emission factors • Advanced EFs: Implementation of HiGRID		X	X	3, 4
Fugitive methane from Natural Gas Use			X	4
Electricity transportation loss			X	Future
Results analysis tools		X		Future