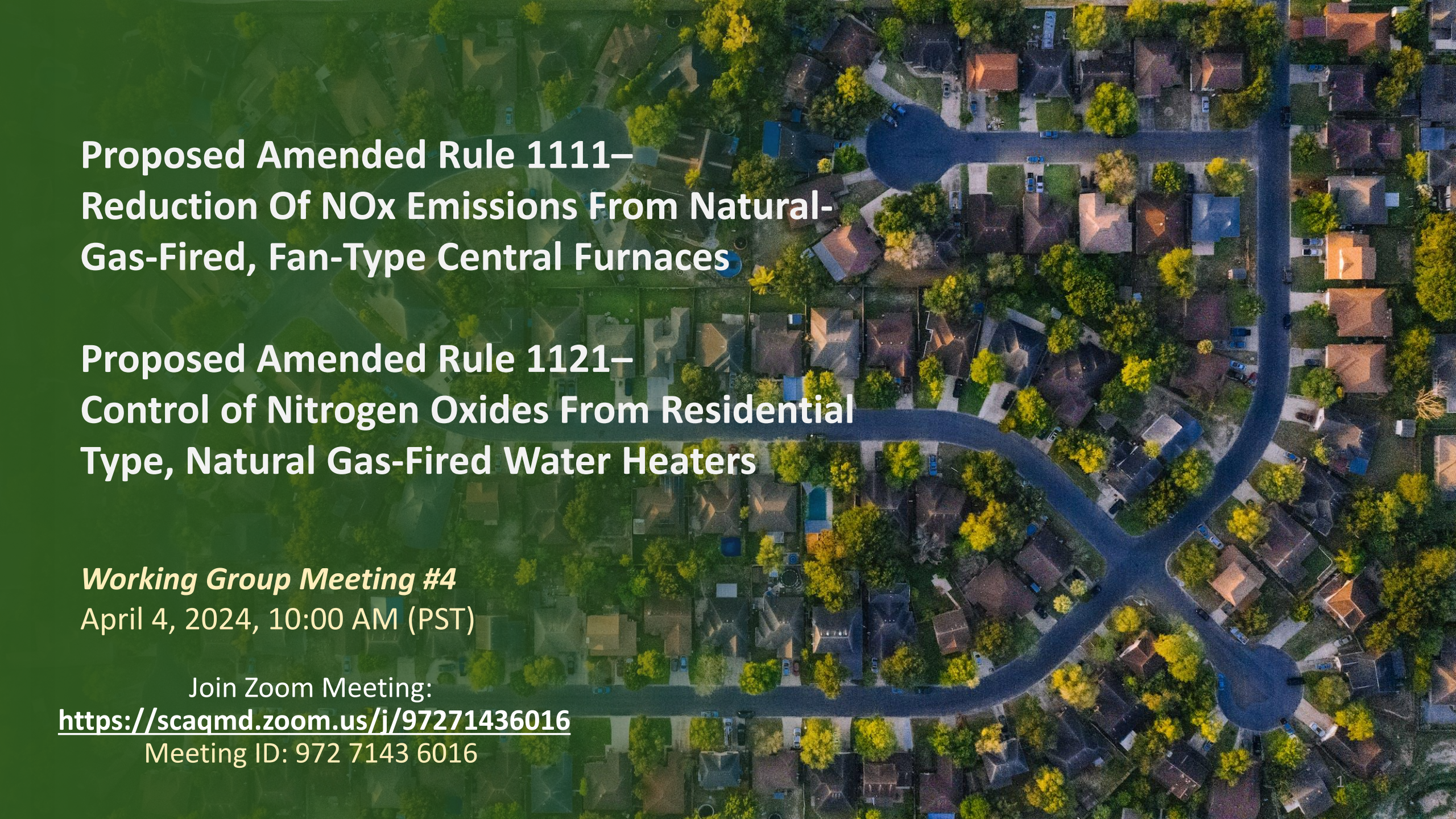


Proposed Amended Rule 1111– Reduction Of NOx Emissions From Natural-Gas-Fired, Fan-Type Central Furnaces

Proposed Amended Rule 1121– Control of Nitrogen Oxides From Residential Type, Natural Gas-Fired Water Heaters

Working Group Meeting #4

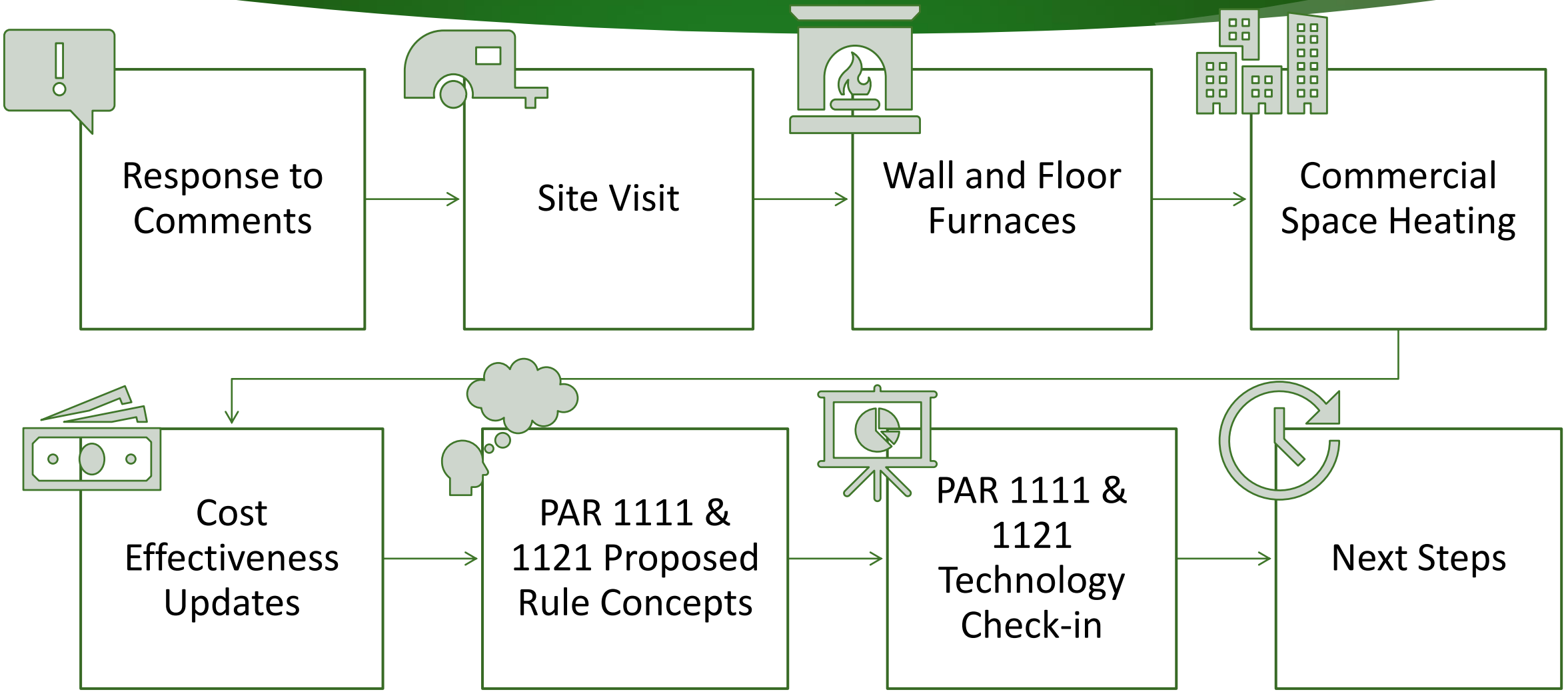
April 4, 2024, 10:00 AM (PST)

Join Zoom Meeting:

https://scaqmd.zoom.us/j/97271436016

Meeting ID: 972 7143 6016

Agenda


Response to Comments
Site Visit
Wall and Floor Furnaces
Commercial Space Heating
Cost Effectiveness Updates
PAR 1111 & 1121 Proposed Rule Concepts
PAR 1111 & 1121 Technology Check-in
Next Steps

Summary of Working Group Meeting #3

In the previous Working Group Meeting, Staff provided background on:

- Response to Comments
- Mobile Homes
- Cost Effectiveness Updates
- Affordability Analysis
- South Coast AQMD Rebate Program

Stakeholder Comments from Working Group Meeting #3

Response to Comment #1

Comment:

- Implementation of zero-emission furnaces and water heaters for mobile homes infeasible:
  - Electrical panel, master-metering, space, and air flow constraints
- Mobile homes should be excluded from the rule

Response:

- Staff acknowledges difficulties of installing zero emission units in mobile homes, especially water heating
- Still continuing assessment, which includes site visit to mobile home park with master-metering
- Rule concept proposals in following slides

Response to Comment #2

Comment from Manufacturer:

- Cost effectiveness calculation should use median of TECH data base cost rather than average to better represent actual installation costs
- Staff should consider implementation date of 2028 for water heating, rather than 2029

Response:

- Staff will use median cost rather than average (included in cost effectiveness update)
- Staff will consider earlier implementation date

Site Visits

Mobile Home Site Visit Background

- Staff understands concern with implementation of zero-emission appliances in existing mobile homes
  - Many new mobile homes are already designed with HVAC heat pumps and heat pump water heaters, such as Clayton Homes eBuilt homes
- Staff previously conducted site visits on 12/8/2023 and 1/11/24 to mobile home parks with individual metering
- Stakeholder feedback indicated that the parks visited were not representative of all mobile home parks and suggested visiting a master-metered park
- Staff coordinated with Southern California Edison to visit a master-metered park to gain more insight and feedback

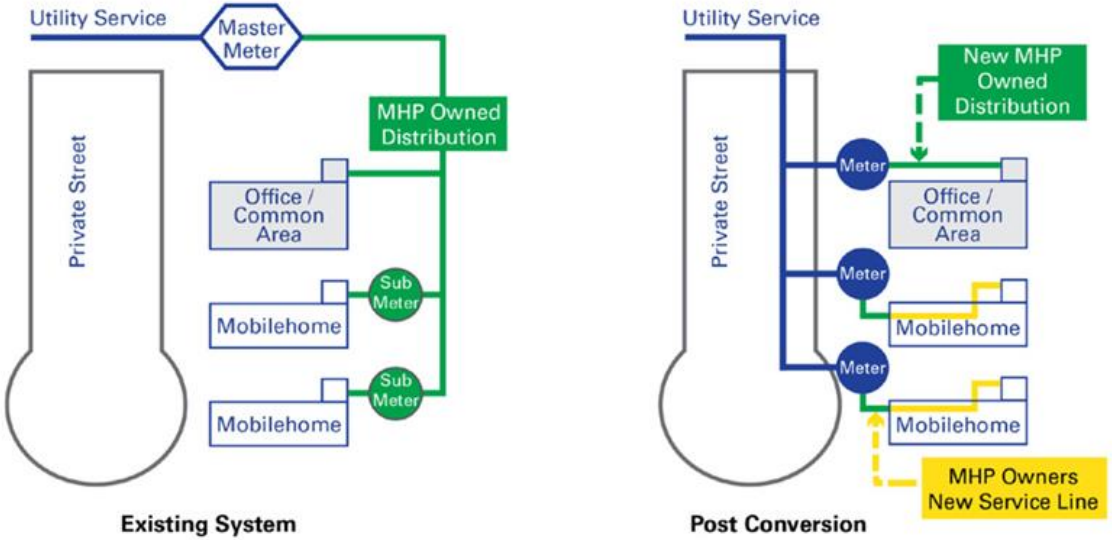
Mobile Home Park Site Visit

- Staff conducted a site visit on March 14, 2024 to a master-metered/sub-metered mobile home park
- Mobile home park is part of the California Public Utilities Commission's (CPUC) Mobile Home Park Utility Conversion Program (MHP-UCP)
  - Program converts mobile home parks to a direct utility service

Mobile Home Park Utility Conversion Program (MHP-UCP)

- Program Phase I began January 1, 2015
- Phase II began January 2, 2021 and the MHP-UCP plans to continue to convert until 2030
- Goal to convert total of 50% of mobile home park spaces in each utility territory to direct gas and/or electric utility service
  - Southern California Edison targeting 3,300 mobile home conversions per year from list of 72,000 mobile homes
- Address safety risks of aged infrastructure and integrated safety net to meet increasing electrical demand

Sample Pre and Post Construction Site Overview



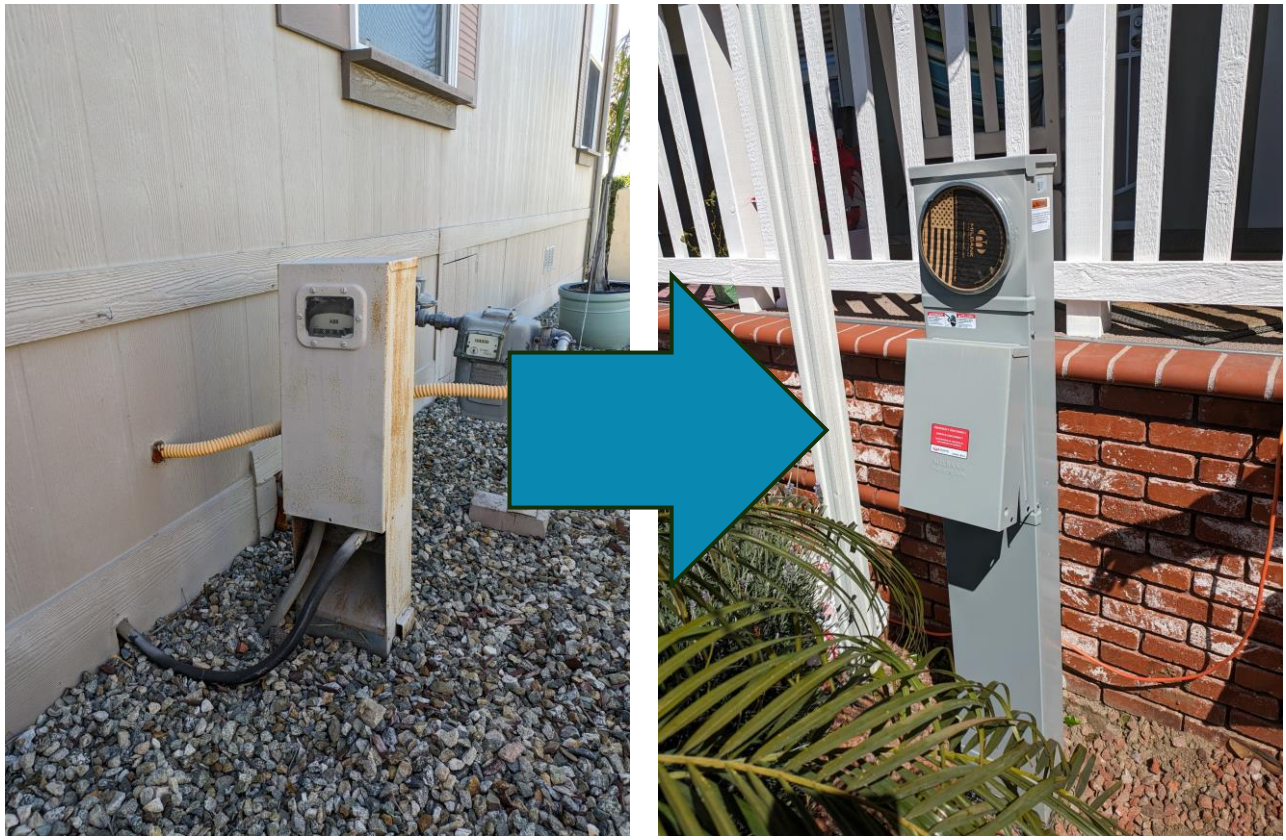
Site Visit

- About 300 mobile homes in the park
- Panels range from 30 amps to 100 amps
  - Majority of homes 50 amps to 100 amps
  - MHP-UCP provides like-for-like replacement of service
  - Infrastructure is in place to provide 100 amps to all mobile homes
- Estimated 18 months to complete all conversions at the site

2000-amp master meter for the mobile home park

Conclusions

- It is feasible for new mobile homes to transition to zero-emission space and water heating
- Staff believes homes need 100 amps electrical service at a minimum to have heat pumps
- The MHP-UCP program is converting mobile homes to individual meters with 100-amp service, but is unlikely to convert all mobile homes by proposed implementation dates
- Adoption of zero emission appliances in mobile homes may take longer than other residential applications



Wall and Floor Furnaces

Background

- Typical sizes range from 10,000 to 50,000 Btu
- Wall and floor furnaces are not currently regulated by South Coast AQMD
- Designed to heat a small area, such as a single room or small apartment
- Over one million units in South Coast AQMD, per the American Community Survey

Emission Inventory

- Wall and floor furnaces are not regulated, staff assumes units emit 40 ng/J of NOx (emissions may be higher)
  - 1,037,000 million units
  - Fuel use from Residential Appliance Saturation Study (RASS)
  - Emission Inventory: 0.52 tons per day
- 23% of residential heating inventory

Conclusions

- Wall and floor furnaces are a significant source of unregulated emissions
- Staff will be including these units in PAR 1111 in requiring zero emissions and conducting BARCT assessment

Commercial Furnaces

Commercial Furnaces

- Furnaces and packaged units are the most common heating equipment for commercial buildings
  - **Furnace** – used solely to heat
  - **Packaged unit** – self contained units with heating and cooling capabilities
    - Packaged units under 5 tons are currently regulated by Rule 1111
    - Units over 5 tons not regulated and have higher emissions potential
- Staff has conducted an evaluation of the commercial furnace emissions inventory and equipment universe

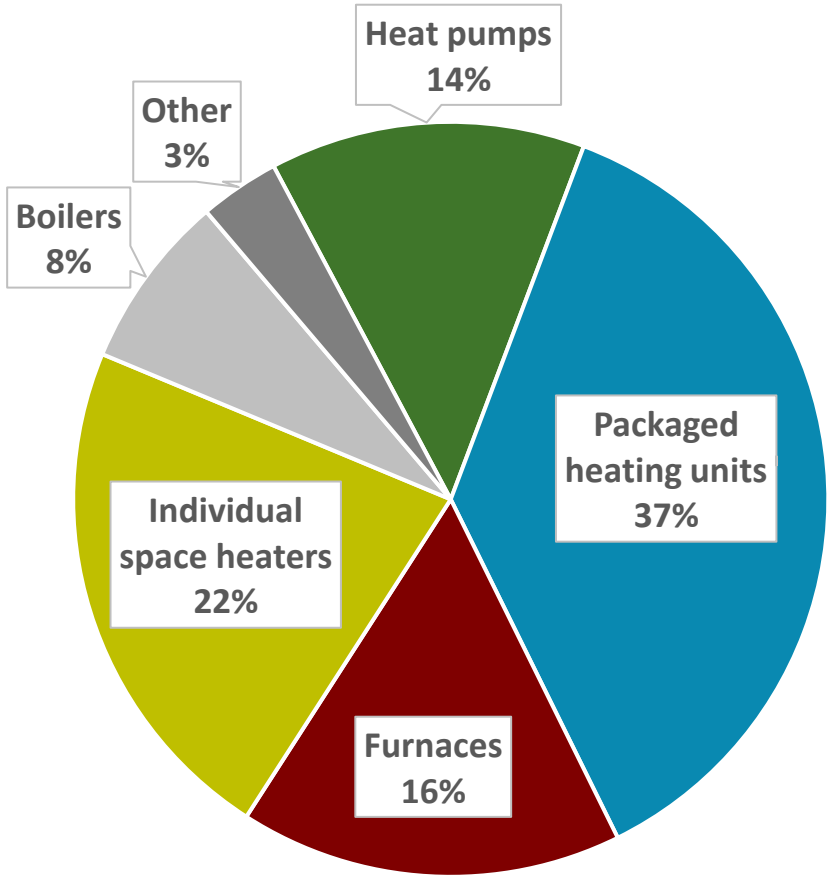
Commercial Building Energy Consumption Survey

https://www.eia.gov/consumption/commercial/data/2018/

- Commercial Building Energy Consumption Survey (CBECS) provides information on the characteristics and energy use of commercial buildings
- Information gathered for 2018 (most recent year)
- Evaluated data for the Pacific Region
  - Includes Alaska, Washington, Oregon, California, and Hawaii
- The following data from CBECS were used for emissions inventory:
  - Heating equipment
  - Natural gas heating use
  - Electricity heating use
  - Number of units

Commercial Building Heating Equipment

- Approximately 252,000 commercial buildings in the South Coast AQMD
- Over 50% of heating equipment comprised of packaged units and furnaces
  - Some packaged units are also heat pumps
- 46% of buildings with heating in the Pacific region use electricity (heat pumps or electric resistance)



Commercial Emissions Inventory

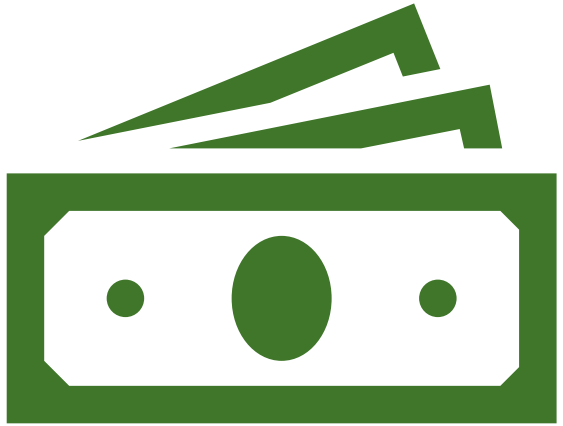
- Daily fuel use extracted and calculated from CBECS data
- Separated gas heating, using 5,000 square feet (sqft)
- Emission factor 40 ng/J for buildings larger than 5,000 sqft and 14 ng/J for buildings smaller than 5,000 sqft
  - Buildings less than 5,000 sqft likely to be already subject to Rule 1111
- Total Emission Inventory: 3.19 tons per day (tpd)

	Gas Heating > 5,000 sqft	Gas Heating < 5,000 sqft
Daily Fuel Use per Unit (therms)	13.7	1.3
Emission Factor (lb/MMBtu)	0.069	0.024
Emission Inventory (tpd)	3.11	0.08

Commercial Furnace Summary

- Staff proposing to include commercial furnaces in PAR 1111
- Implementation of zero-emission commercial units should be feasible
- Commercial furnaces will be part of the BARCT assessment
- Cost effectiveness assessment presented in the following slides

Cost Effectiveness



Updates to Cost Effectiveness

Several significant updates to cost effectiveness values presented in Working Group Meetings #2 and #3:

- New residential fuel switching costs due to updates from the California Energy Commission
- New cost effectiveness calculations for commercial furnaces
- Evaluating costs collected by other organizations

Utility Rate Projection

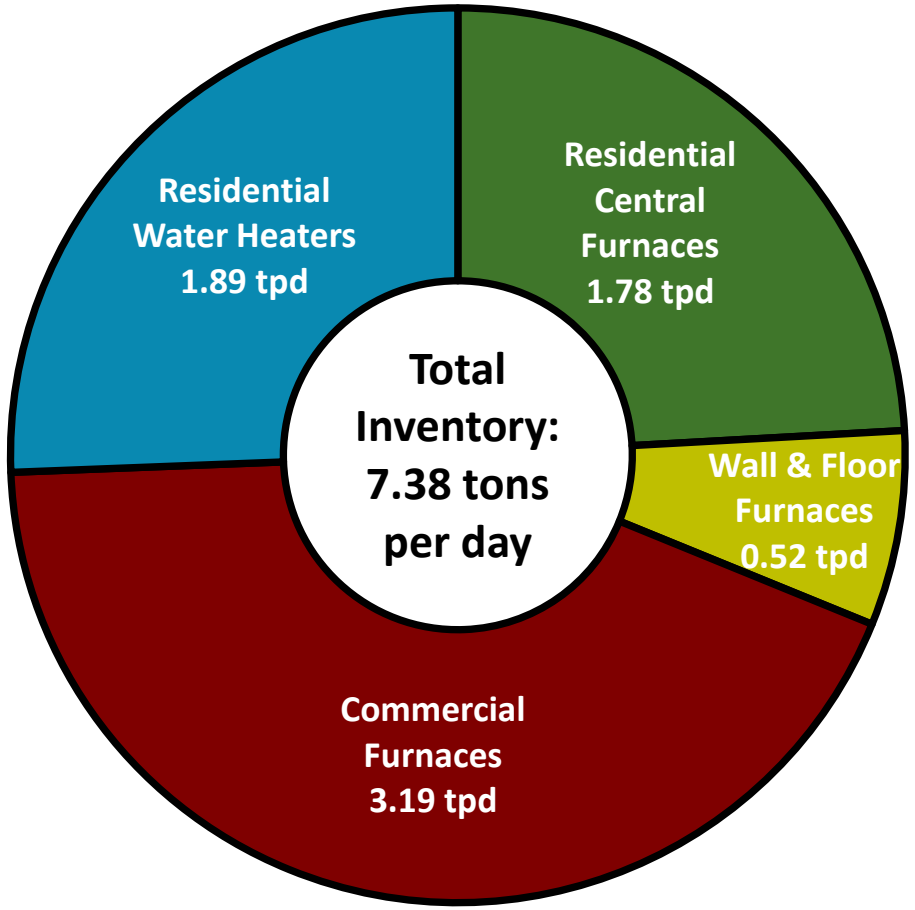
The California Energy Commission (CEC) releases the Integrated Energy Policy Report (IEPR) every two years

- Reports projected future rates of gas and electricity
- Staff was relying on 2021 IEPR for cost effectiveness assessment
  - Impacts the cost to switch from natural gas-fired units to heat pumps
- Newest IEPR released on January 1, 2024:
  - Projected natural gas rate to increase 50%
  - Projected electricity cost to have a more moderate increase of 21%
- New projected rates decrease cost-effectiveness estimates

Update to Residential Utility Rate Projections:

Utility Rate (cents per kWh)	2021 IEPR	2023 IEPR
Natural Gas	3.77	5.66 (↑ **50%**)
Electricity	21.77	26.39 (↑ **21%**)

1111/1121 Emission Inventory Update



- Emissions from new categories in this working group meeting are more than 50% of inventory
  - Wall and floor furnaces inventory included in residential furnaces for cost effectiveness purposes
  - Commercial furnace inventory used for separate commercial cost effectiveness

Residential Cost Effectiveness Update

- New IEPR rates have significant impact on cost effectiveness
- Adding wall and floor furnaces increases the overall emissions inventory, somewhat improving cost effectiveness for HVAC
- Changing to median costs from TECH data:
  - Heat Pump Water Heater Average Cost → Median Cost: **$5,700 → $5,200**
  - Heat Pump HVAC Average Cost → Median Cost : **$18,500 → $18,550**
- Zero-emissions more cost effective across the board, heat pump water heaters with no incentives now under screening threshold of $349,000 per ton

Category	Cost Effectiveness (Panel Upgrade Shared)
Heat Pump HVAC	
No Incentives	~~$38,000~~ ($196,000)
IRA Incentive	~~($608,000)~~ ($1,031,000)
TECH Incentive	~~($285,000)~~ ($614,000)
Both Incentives	~~($931,000)~~ ($1,448,00)
Heat Pump Water Heaters	
No Incentives	~~$768,000~~ $246,000
IRA Incentive	~~$253,000~~ ($226,000)
TECH Incentive	~~($170,000)~~ ($692,000)
Both Incentives	~~($685,000)~~ ($1,064,000)

Commercial Cost Effectiveness Calculation

$$Cost\ Effectiveness\left(\$/_{tons\ NOx\ reduced}\right) = \frac{Cost\ Difference\ in\ Initial\ Investment\ Cost + (Fuel\ Switching\ Cost\ * PVF)}{Lifetime\ Emission\ Reductions}$$

- Costs calculated using following variables and sources:
  - Capital costs of zero-emission unit and gas unit
  - Fuel Switching Cost:
    - 2023 IEPR electricity and gas demand
    - Daily fuel use from CBECS based on electric and gas heating usage
  - Present Value Factor (PVF) = current worth of future sum of money
    - 11.118 assuming 15-year equipment lifetime

Commercial Cost Effectiveness Calculation

- Used capital costs to calculate cost difference
  - Capital costs gathered from internet research
  - Compared packaged gas units and packaged heat pumps of the same cooling capacity (tons)
- PAR 1111 considers a $349,000 cost-effectiveness screening threshold
- Preliminary calculations suggest commercial furnaces are cost effective

Size (tons)	Cost Difference	Fuel Switching Cost	Cost Effectiveness ($/ton)
5	$200	($24,000)	($91,000)
6	$1,000	($24,000)	($87,500)
7.5	$750	($24,000)	($88,750)
8.5	$1,250	($24,000)	($87,000)
10	($650)	($24,000)	($94,000)

Comparative Cost Effectiveness

Other organizations are also collecting installation and operating cost information:

https://techcleanca.com/public-data/evaluation-studies/

TECH Clean California

- Survey of incremental costs gathered from participating contractors
- Intended to provide better understanding of baseline installation costs
  - Minimum efficiency equipment
- Focused on heat pump HVAC

Bay Area AQMD

- Study performed by Rincon Consultants
  - Presented at Implementation Working Group on 2/28/24
- Covers both baseline installation and operating costs
- Focused on heat pump water heaters

TECH Cost Data Survey

- TECH survey has slightly higher incremental cost, resulting in slightly higher cost effectiveness
- BAAQMD study has range of fuel switching costs, with most costs under cost effectiveness threshold

Scenario	Median Incremental Cost	Lifetime Fuel Switching	Cost Effectiveness ($/ton)	South Coast AQMD Cost Effectiveness
TECH Study				
AC and Gas Furnace → Heat Pump	**$1,805**	**-$1,400***	**$176,000**	**-$686,000**
Gas Furnace → Heat Pump	**$9,250**	**-$1,400***	**$3,282,000**	**$2,980,000†**
Bay Area AQMD Study				
HPWH Worst Case Fuel Switching Cost	**$1,905**	**$340**	**$679,000**	**$246,000**
HPWH Best Case Fuel Switching Cost	**$1,905**	**-$10,000**	**-$2,472,000**	**$246,000**

* Using fuel switching costs from South Coast AQMD's analysis

† Scenario of units without existing AC, about 13 percent of residences in South Coast AQMD

Summary

New updates make more residential categories cost effective

Commercial furnaces are cost effective

Other organizations analyses align with our cost effectiveness analysis

Staff's assessment concludes that zero-emissions is feasible for all furnace and water heater categories

PAR 1111 & 1121 Rule Concepts

PAR 1111 Rule Concepts - General

- Extend rule applicability to include commercial furnaces, floor furnaces, and wall furnaces
- Propose zero NOx emission requirements
  - Applicable to manufacturers, distributors, retailers, resellers, and installers (point-of-sale)
- Future implementation dates by equipment categories
  - Allowing for zero-emission technology market growth and building readiness
- Clean up rule language, remove obsolete requirements

1111 Rule Concepts

- Zero NOx emission requirements applicable at point-of-sale
- New buildings are more ready for earlier implementation
  - Compliance date aligns PAR 1146.2 and implementation of 2025 building code
- Residential Furnaces including previous category Fan-Type Central furnace, and new categories Floor furnaces and Wall furnaces
- Commercial furnaces on same timeline as Residential
- Proposing longer compliance dates for Mobile Home furnaces in existing buildings (2030)
  - May extend timeline during technology check-in depending on readiness
  - Proposing to conduct a technology check-in by 2027

Equipment	Building Type	NOx Limit (ng/J)	Compliance Date
Residential Furnace	New	0	January 1, 2026
	Existing	0	January 1, 2028
Mobile Home Furnace	New	0	January 1, 2026
	Existing	0	January 1, 2030
Commercial Furnace	New	0	January 1, 2026
	Existing	0	January 1, 2028

PAR 1121 Applicability and Requirements

Applicability

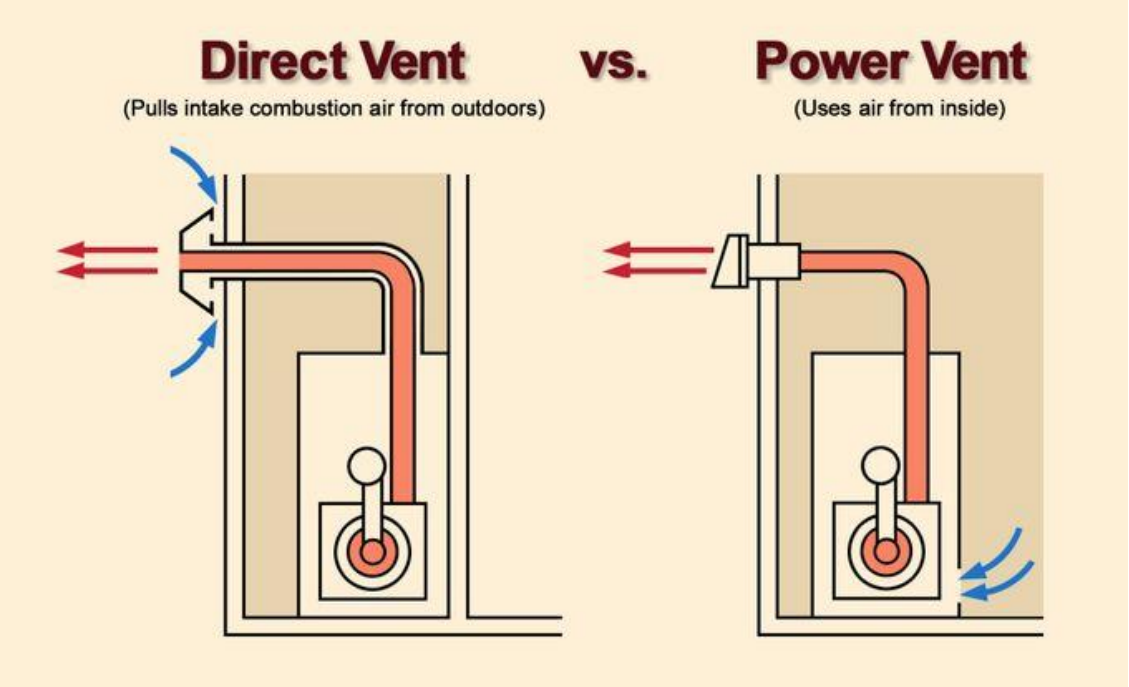
- No changes to applicability
- Natural gas-fired water heaters with heat input less than 75,000 Btu/hr
  - Mainly residential units
  - Instantaneous/tankless water heaters subject to Rule 1146.2
- Applies to manufacturers, distributors, retailers, resellers, and installers (point-of-sale)
- Water heaters in recreational vehicles exempt

Requirements

- Propose zero NOx emissions from natural gas-fired water heaters
- Removal of obsolete requirements
- Rule 1121 currently requires natural gas-fired water heaters to emit no more than 10 ng/J (15 ppm)
  - Natural gas-fired mobile home water heater limit is 40 ng/J (55 ppm)

Rule 1121 Background

- Current NOx limit became effective in 2006 – 2008, implementation dates vary depending on the type of vent configuration
  - **Atmospheric Vent** – vent combustion using vertical duct
  - **Direct Vents** – draw air for combustion and vent from outside of home
  - **Power Vent** – use fan or blower to vent combustion gas
  - **Direct Power Vent** – uses blower to draw air and vent air from outside of home
- PAR 1121 will not have different implementation dates by the vent configuration for proposed zero-emission requirements
  - No combustion for zero-emission technologies

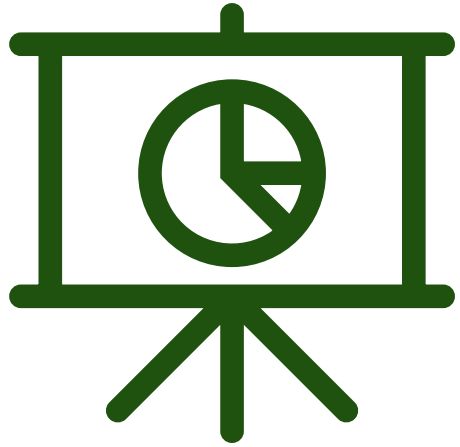


PAR 1121 Proposals

- Zero-emission requirements applicable at point-of-sale
- Future implementation dates allow for zero-emission technology market growth and building readiness
- New buildings are more ready for earlier implementation
- Existing mobile homes need more time for building readiness to implement zero-emission requirements
  - May extend timeline during technology check-in depending on readiness
  - Proposing to conduct a technology check-in by 2027

Equipment	Building Type	NOx Limit (ng/J)	Compliance Date
Water Heater	New	0	January 1, 2026
	Existing	0	January 1, 2028
Mobile Home Water Heater	New	0	January 1, 2026
	Existing	0	January 1, 2030

PAR 1111 and 1121 Technology Check-in



Technology Assessment Text in Resolution

The technology check-in will be included as part of the Resolution included with the Governing Board Package such as:

*"**BE IT FURTHER RESOLVED**, that the South Coast AQMD Governing Board directs staff to report on the status of the zero-emission technologies for mobile homes by 2027 and conduct a technology assessment if there are potential challenges for any equipment category; and amend the requirements through the public process for applicable equipment categories if deemed appropriate"*

Next Steps

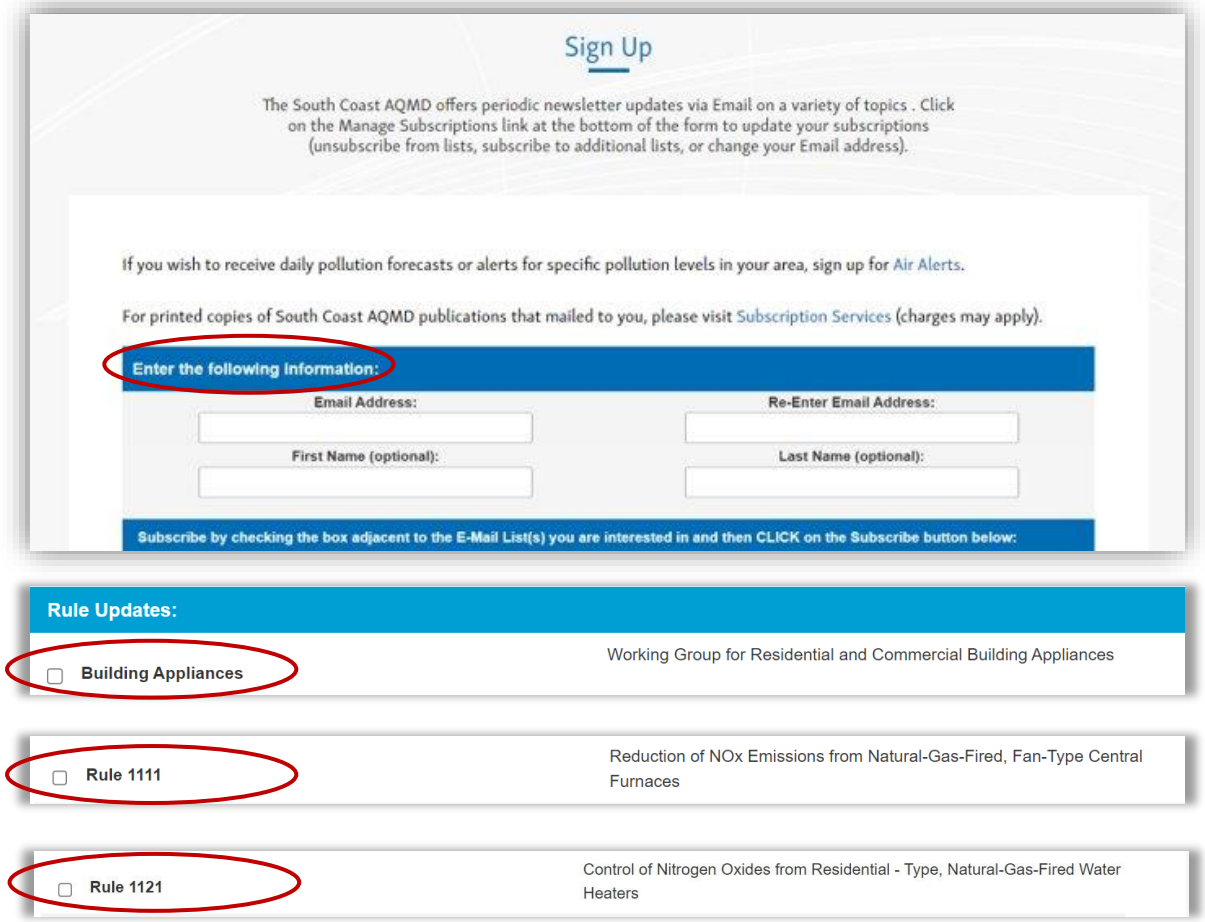
Next Steps

- Prepare preliminary draft rule language for discussion
- Continue Working Group Meetings
- Conduct site visits and hold stakeholder meetings
- Develop pilot rebate program to incentivize early transition to zero-emission technologies
- Anticipated Public Hearing: 4th Quarter 2024

Sign Up for Notifications

- To receive newsletter updates via email for notifications regarding the 1111 and 1121 rule development and other forthcoming building appliances rules, please subscribe by checking the **Rule 1111, Rule 1121,** and **Building Appliances** check boxes located under Rule Updates: http://www.aqmd.gov/sign-up

- To receive printed copies of South Coast AQMD publications via mail, please visit: http://www.aqmd.gov/nav/contact/subscription-services



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