# 2022 AQMP: RESIDENTIAL AND COMMERCIAL BUILDINGS

Working Group Meeting #2

February 26, 2021

# Agenda

- Items addressed at previous working group meeting
- Emission inventory update
- Update on South Coast funded projects and programs
- Other new developments for the residential and commercial building sector
- Latest incentive and grant programs
- Key challenges
- Next steps

# Previous Working Group Meeting

- **December 17, 2020 WG Meeting addressed:**
  - Framework
  - Goals & Objectives
  - Emission Inventory
  - NEAT model
  - Role of South Coast AQMD, regulations and incentives
  - Federal, State, and Local programs
  - Timetable for control measure development in 2022 AQMP

# Emission Inventory Update

- At the last Working Group Meeting provided:
  - NOx emissions from stationary sources including those from residential and commercial buildings
  - Residential and commercial buildings natural gas emission sources including space heating and water heating
- Data provided was based on 2016 AQMP
- Stakeholders requested any of the latest data being generated during the current development of the 2022 AQMP

# Updated Draft Residential and Commercial Buildings Emissions Inventory (natural gas)

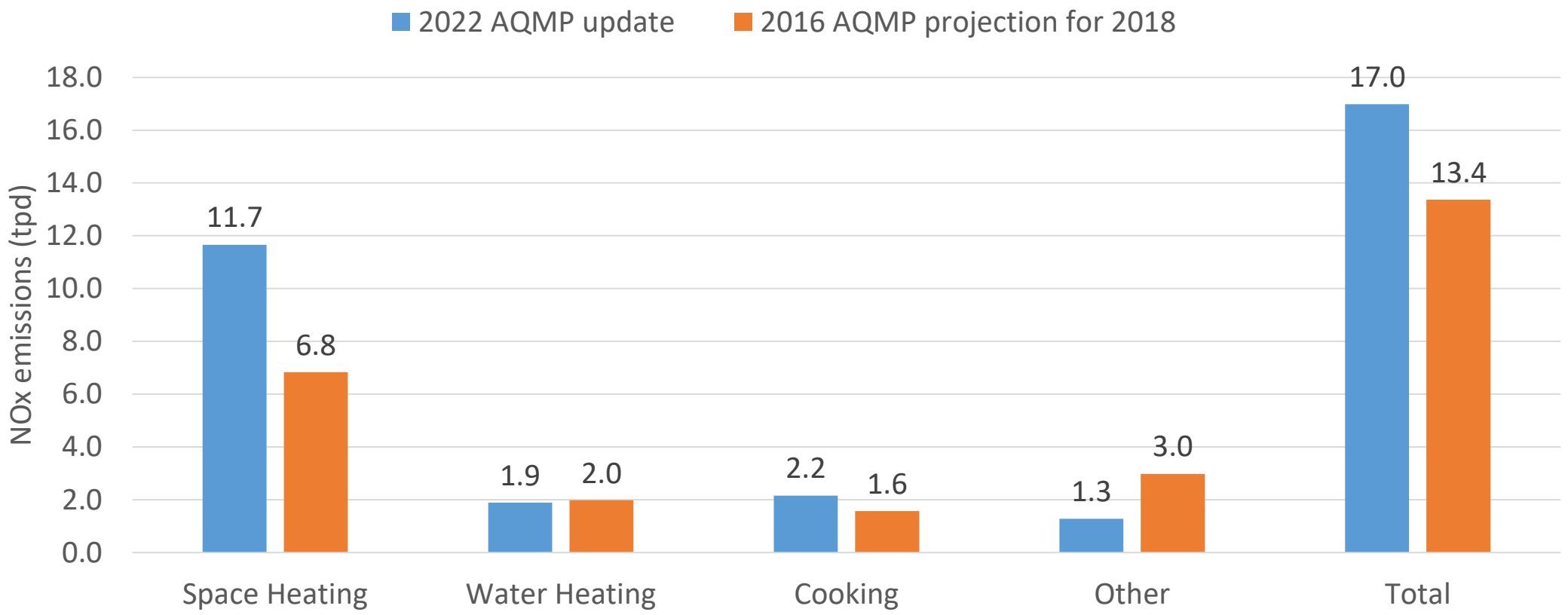
## Base Year

- 2018 (available now)
- Updated Natural Gas Consumption Data
- Updated emission factors consistent with District's regulations (R1111, R1121, R1146.2 and R1147)
- 2018 AER reported data to split between internal and external combustion

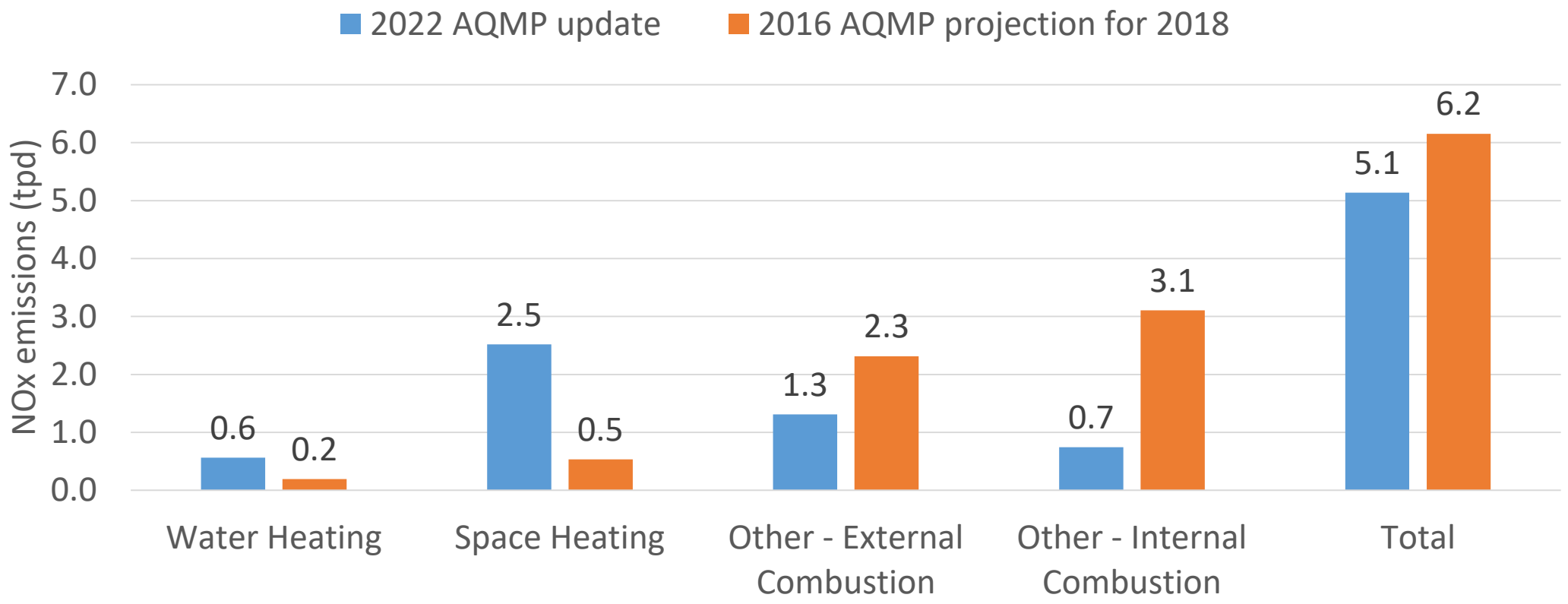
## Future Years

- 2023, 2031, 2037 and other milestone years
- Growth scalars based on 2020 RTP
- District's regulation (R1111)
- Under Development, to be available in April – May 2021

# 2018 NOx Emissions from Residential Sector



# 2018 NOx Emissions from Commercial Sector



# Update on South Coast AQMD Funded Projects and Programs

- At the last Working Group Meeting the following South Coast AQMD funded projects and programs were introduced:
  - Emission reduction projects funded in 2019 to support control measures CMB-02 and ECC-03
    - ~$15 million on 8 projects specifically targeting building appliances, heating, and energy
  - Clean Air Furnace Rebate Program
  - Effort to develop controls for commercial cooking devices to support CMB-04
- Will provide project/program update and discuss future objectives

# Update South Coast AQMD Funded Research Or Demonstration Projects

*NOx Reductions in Residential and Commercial Buildings*

| Specific Project Goal | Status (Ongoing) |
|---|---|
| Ultra low-NOx commercial deep fat fryer development (80% NOx reduction) | *Final report expected December 2021* |
| Next generation prototype residential gas furnace for 7 ng/J NOx | *Certify furnace in 2022* |
| New swirl flame burner for 5-8 ng/J NOx (commercial furnaces) | *Certify burner in late 2021* |
| Demonstration of EcoZone for optimal air-gas ratio control with combo ribbon burners for commercial wholesale baking oven (25% NOx reduction) | *Testing/data collection by December 2021 and final report expected December 2022* |
| Multifamily affordable housing electrification project (replacing combustion based water heating, space heating, cooking, laundry appliances with electric heat pumps and induction cooktops) | *Contract is ready but project on hold due to COVID* |
| Residential weatherization retrofit project (San Fernando and Coachella Valleys) | *Both projects started and close to completion pending more funding to be allocated* |
| SoCal Gas Company high efficiency water heating incentive program | *Project on hold while SoCal Gas seeks participating manufacturers* |
| Residential fuel cell demonstration with integrated Photovoltaic (PV) and storage | *Manufacturer closed business in U.S. so seeking other participating manufacturers* |

# Clean Air Furnace Rebate Program

- The Clean Air Furnace Rebate Program was developed in 2018, in conjunction with the South Coast AQMD Rule 1111
  - Incentivizing early deployment of ultra-low (14 ng/J) NOx furnaces
- The program was  launched on June 28, 2018 with an initial funding of $3 million
  - https://www.cleanairfurnacerebate.com
- An additional funding of $3.5 million was approved on September 4, 2020
  - Expanding the rebate to zero emission heat pump systems installed as Rule 1111 furnace replacement

# Commercial Cooking

- Part of the 2016 AQMP Control Measure CMB-04
- Test methods development and baseline NOx and CO emission rates determination for several types of natural gas fired commercial cooking equipment
  - Collaborated with the Gas Company and the food service industry
  - Contracted Frontier Energy, Inc. (Jan 26, 2017 – June 30, 2018) for testing some units
  - Tested 48 units: Boilers, fryers, griddles, and ovens
  - Developed nine test protocols
- Next steps:
  - Approve and analyze test results
  - Determine if additional testing should be performed
  - Seek further collaboration with other entities for CMB-04

# Other New Developments for the Residential and Commercial Building Sector

- New technologies:
  - Ring-Stabilizer burner technology for residential and commercial cooking appliance by Lawrence Berkeley National Laboratory
  - Prototype 120-volt unitary unit heat pump water heater development
- The next steps for those developments would be additional field assessment, market commercialization, and program promotion

# Residential and Commercial Cooking Appliances

- Lawrence Berkeley National Laboratory (LBNL) burner technology development (2016)
- Ring-Stabilizer Burner combustion technology for residential and commercial natural gas fired cooking appliances (such as ovens, ranges, and cooktops)
- Project Results:
  - Showed NOx emissions reduction by 80 percent compared to conventional technology
  - The lowest measured operational NOx levels are below 20 parts per million (ppm) at 3 percent oxygen
- Next steps:
  - Prototype cooking appliances development
    - Integrating the new burner technology
  - Commercialization

# Heat Pump Water Heaters

- Uses electricity to move heat from the surrounding air into a tank to heat water
- Two to three times more energy efficient than conventional electric resistance water heaters
- Provides co-benefit on NOx emissions reduction, in addition to greenhouse gas emissions reduction
- The market mature technology for unitary heat pump water heater requires 240-volt
- The challenges of 240-volt unitary heat pump water heater is on connectivity (electrical panel upgrade) and cost
  - California Public Utilities Commission's current incentive programs: 16 separate incentive programs under implementation or review, with approximately $435 million fund through 2024
- 120-volt unitary heat pump water heater currently is not commercially available
  - Prototype under safety testing (see next slide)

# 120-Volt Unitary Heat Pump Water Heaters

- 120-volt Unitary heat pump water heaters are ready to plug in to existing wall outlets without requiring panel upgrades and/or home rewiring
- Expected to be suited to smaller homes with lower hot water demand
- Development status:
  - General Electric (GE) launched a 120-volt heat pump water heater prototype development in 2020, and two other manufacturers are ready to initiate the development
  - The Advanced Water Heating Initiative (AWHI) has proposed a research plan for:
    - Field assessment for energy performance, installer acceptance and user satisfaction to advance market commercialization and program promotion

# Latest Incentive and Grant Programs for the Residential and Commercial Building Sector

- Other Incentives and Grant Programs:
  - Proposed federal tax credits under the GREEN Act
  - California Energy Commission's 2020 grants for HVAC systems at public schools

# Proposed Federal Tax Credits

The Growing Renewable Energy and Efficiency Now Act of 2021 (The GREEN Act)

**General Overview:**

Renewable Energy Production Tax Credit

- For electricity producers - municipal solid waste, hydropower, marine and hydrokinetic energy, geothermal, wind, and solar

Renewable Energy Investment Tax Credit for Property Owners

- 30% extended through 2026
- Includes current solar, small and offshore wind, geothermal, fuel cell, microturbine, combined heat and power, and waste energy recovery properties
- Expands to include energy storage and linear generator technologies

# Green Act (continued)

Alternative Fuel Tax Credit

- Electric, liquified hydrogen, natural gas, propane, E85, and 20% biodiesel

Non-Business Energy Property Tax Credit

- Windows, doors, skylights, roofs, insulation, heating and air conditioning, water heaters
- Extends through 2026
- Increases the lifetime cap on credits from $500 to $1200
- Expands credit to cover 30% of the cost of home energy audits up to $150

# Green Act (continued)

Energy Efficient Commercial Building Deduction

- Increases the maximum deduction from $1.50 per sq. ft. to $3.00 per sq. ft.
- Lowers eligibility threshold -- property must reduce energy costs by 30%, not 50%

New Energy Efficient Home Credit for Eligible Contractors

- Extends through 2026
- Expands maximum benefit from $2,000 to $2,500
- Lowers the eligibility threshold of energy expenditures by 15%

# California Energy Commission's 2020 Grant Programs

- Established through Assembly Bill 841 - *School Energy Efficiency Stimulus (SEES) Program*
- Provides funding to two grant programs to:
  - Upgrade heating, air conditioning, and ventilation (HVAC) systems in public schools
  - Replace noncompliant plumbing fixtures and appliances that fail to meet water efficiency standards
- Prioritize investments at facilities in underserved communities
- Held a workshop on January 22

# Key Challenges Moving Forward

Affordability

Regulatory Mechanism

Product Availability

Consumer Interest

Real, Quantifiable, Surplus, Enforceable, Permanent

Legal Authority

# Affordability

- New technology tends to cost more compared to existing technology sold in a competitive market over time
- Higher costs typically to compensate for research/development and before competitive market has been established
- To purchase or replace appliances varies on equipment age (i.e., urgency to replace) and whether cost effectiveness
- Potential for incentives and/or rebates helps drive cost down for consumer
- Potential to provide incentives to consumers in disadvantaged communities

# Regulatory Mechanism

- Seeking emission reductions to meet air quality standards in AQMP
- One option is new more stringent regulatory emission limits for new, modified or existing equipment
- Limits met by existing or emerging control technologies
- Timing to implement is critical in meeting emission target goals and yet need to be reasonable for successful outcome
- Regulation needs to be submitted into State Implementation Plan (SIP) for emission reduction credit
- Need approval of CARB and US EPA for submittal into the SIP

# Product Availability

- Competitive new technology market
- Successful design or prototype still needs testing and real world operation
- Ability to demonstrate technology in a variety of different applications or settings
- Consumer confidence and proper outreach
- Production and distribution challenges (e.g., effective and dependable supply chain)

# Customer Interest

- Uncertainty to forecast
- Trends and interest level can change over time
- Recent surge in environmental interest in climate change and green energy
- Sway from strong political or business leadership
- Lifestyle preferences such as cooking with gas stove versus electric stove
- Uncertainty of reliability and operation of new technology
- Encouraged when provided incentives or rebates

# Real, Quantifiable, Surplus, Enforceable, and Permanent

US EPA requires emission reductions achieved from incentive programs to be credited into the State Implementation Plan (SIP) as long as it can be demonstrated to be:

- **Real/Quantifiable** – measurable reductions supported by technical data
- **Surplus** – reductions are above and beyond any air district, state or federal regulation already included in the SIP
- **Enforceable** – ensures reductions occur with independent verification, defined violations, identified liable parties and penalties, and general public access
- **Permanent** – ensure reductions remain throughout the duration of the program

# Legal Authority

- Pursuant to California Health & Safety Code
  - Cannot infringe on the existing authority of counties or city to plan or control land use (Section 40414)
  - If setting an emission limit, cannot set operational or effectiveness requirements for any specific emission control equipment operating under that limit (Section 40001(c)(3))
- Can establish regulations for certain appliances in new home builds (similar to no wood burning fireplaces in new developments under Rule 445 or new units meeting a standard)
- Can coordinate efforts and develop programs in partnership with state and local governments

# Next Steps

- Presentation from CARB on green building programs and other state-level activities
- Continue to evaluate options for NOx reductions from stationary appliances
- Continue to seek opportunities to incentivize new technologies
- Welcome ideas to sponsor and conduct technology demonstrations
- Establish partnerships with state and local agencies or develop programs in partnership with state and local agencies
- Begin preliminary write up of a residential/commercial building control measure for 2022 AQMP and provide to WG for input

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