

# Regional Decarbonization Framework

**A Collaborative Effort  
to Lower the Region's  
Carbon Footprint**

**Buildings Sector Workshop**

April 28, 2022



# Learning from Our Past

There is harmony between land, nature and its people. While true for all neighborhoods, one specific group of people have endured displacement from their lands, persecution, and systemic oppression and deserve special recognition today.

As we begin our journey of regional decarbonization, we acknowledge the unceded territory and homelands of the 17 tribal nations in the region – the most in any county in the United States.

Kumeyaay/Diegueño

Luißeño

Cupeño

Cahuilla



# Regional Decarbonization Framework



# Integrated Regional Decarbonization Framework



**Technical Report  
led by UC San Diego**

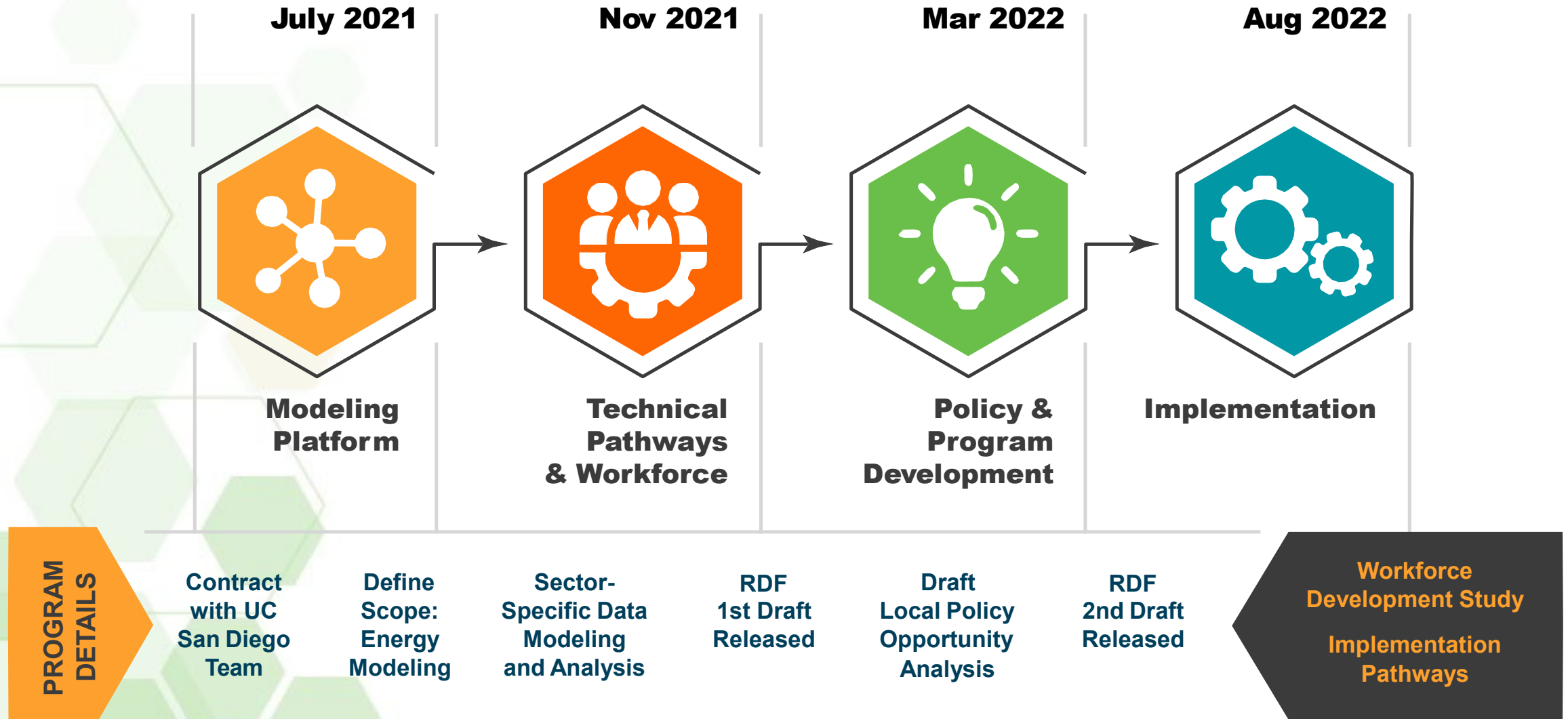


**Workforce Development  
Study by Inclusive  
Economics**



**Implementation  
Pathways**

# Timeline



# Initial Comment Period

Individual members of the San Diego regional community

Building Electrification Institute

Building Industry Association of San Diego County

California Air Resources Board

Climate Action Campaign

J. Whalen Associates Inc.

San Diego 350

San Diego Building Electrification Coalition

San Diego County Air Pollution Control District

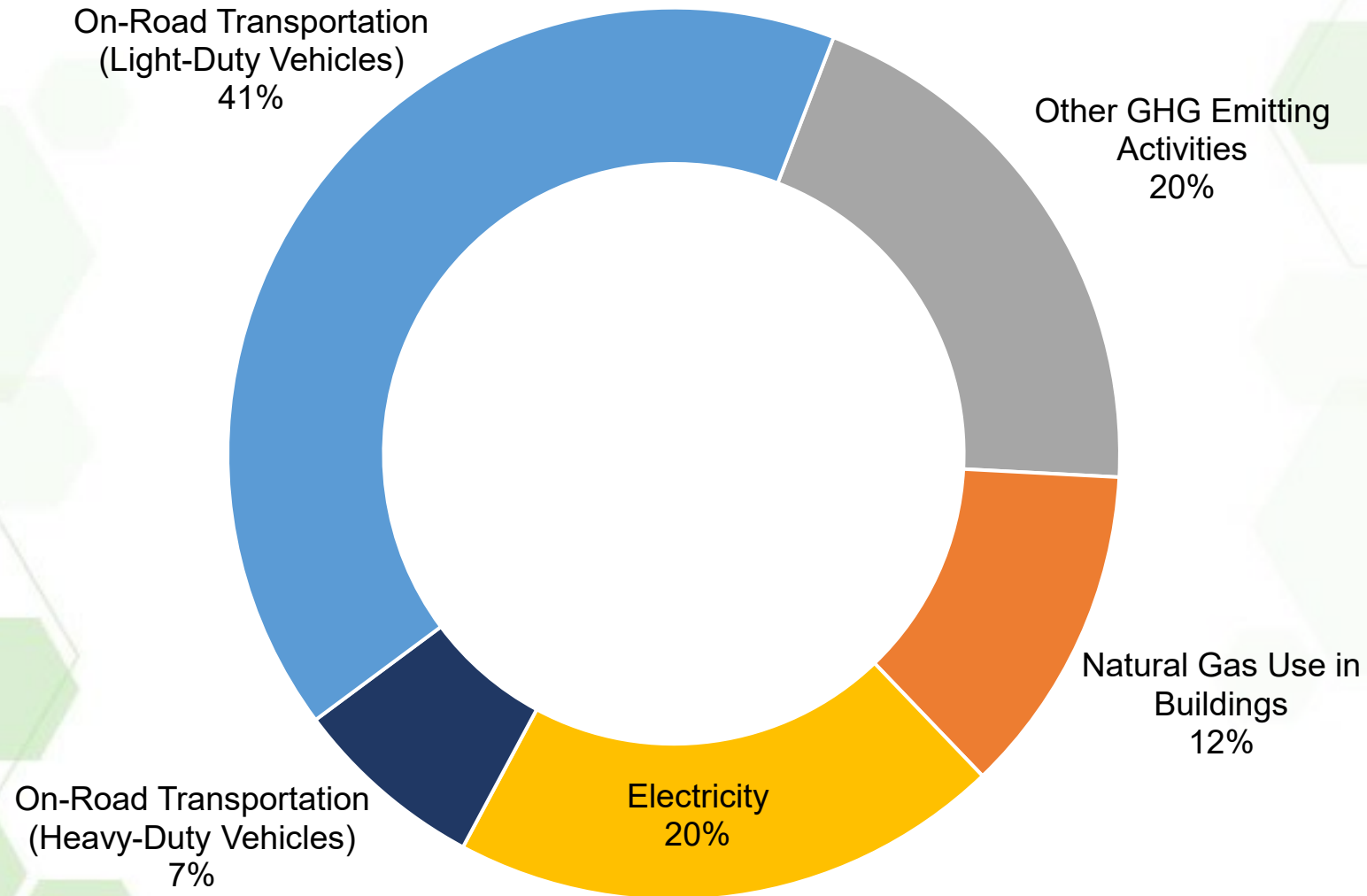
San Diego Regional Policy & Innovation Center

Sierra Club of San Diego

Southwest Wetlands Interpretive Association

Vice Chair Vargas's staff

# Regional Emissions of Greenhouse Gases, Measured in Carbon Dioxide Equivalent



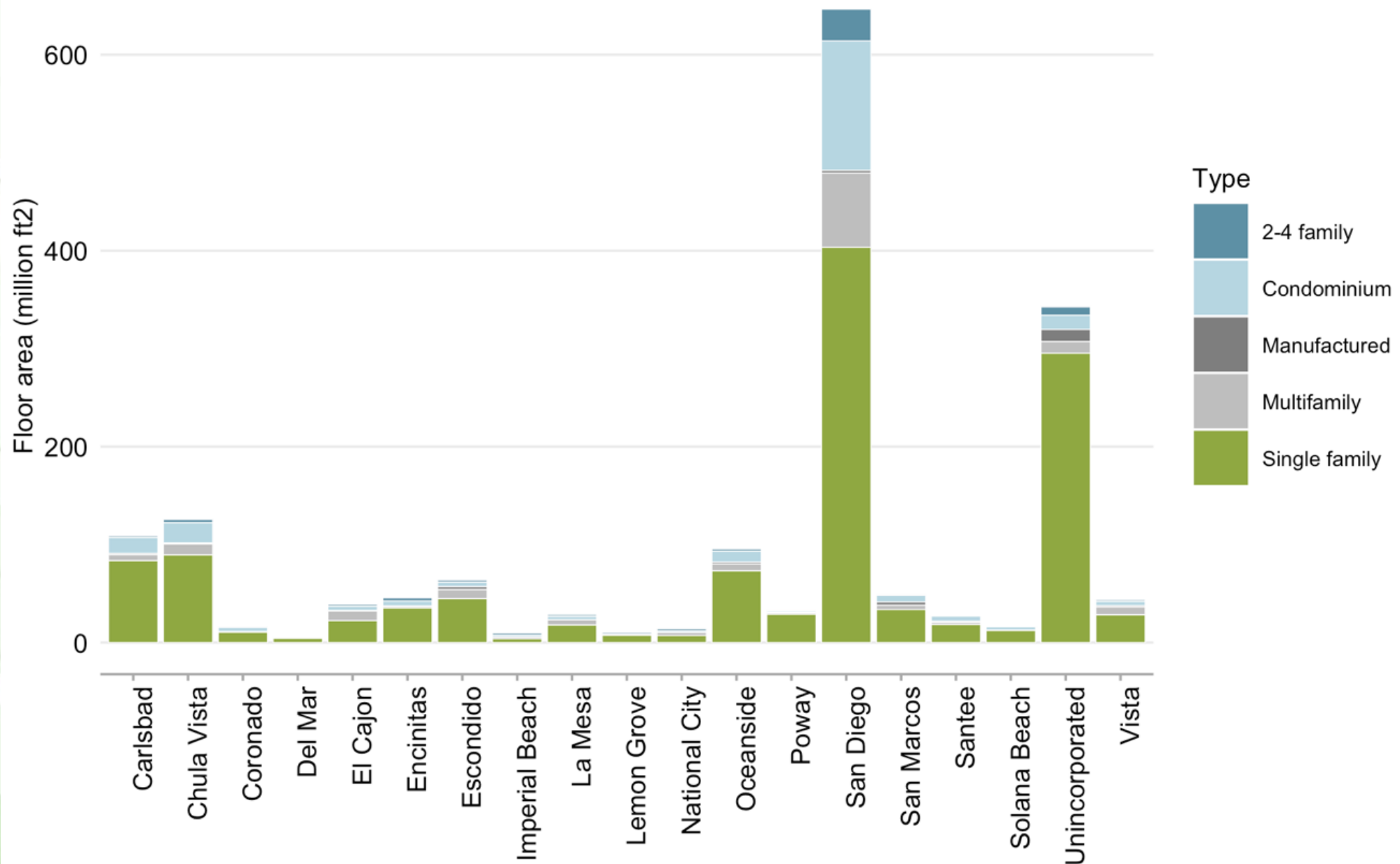


# Four Decarbonization Pathways



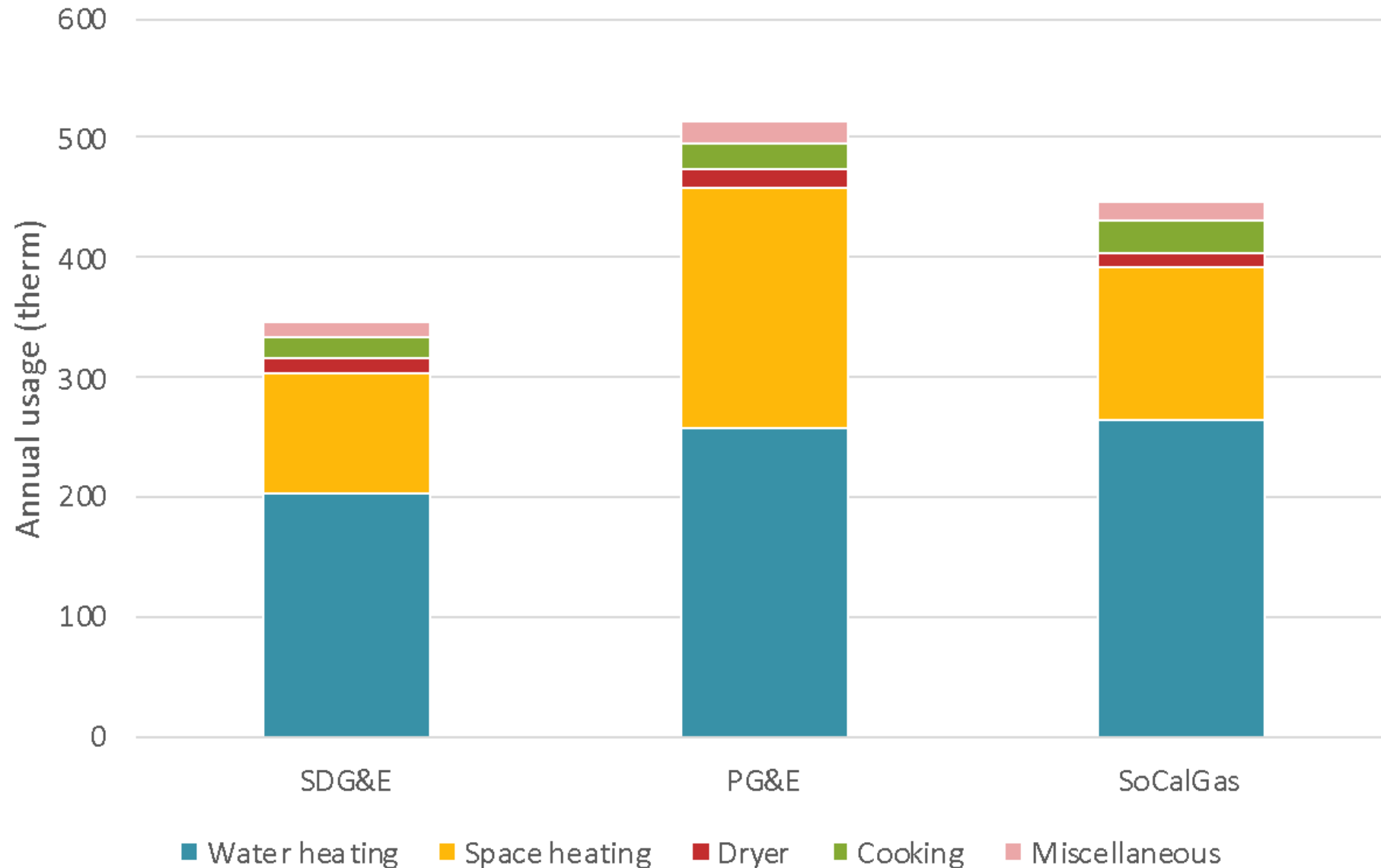


# Regional Residential Building Space (million square feet)



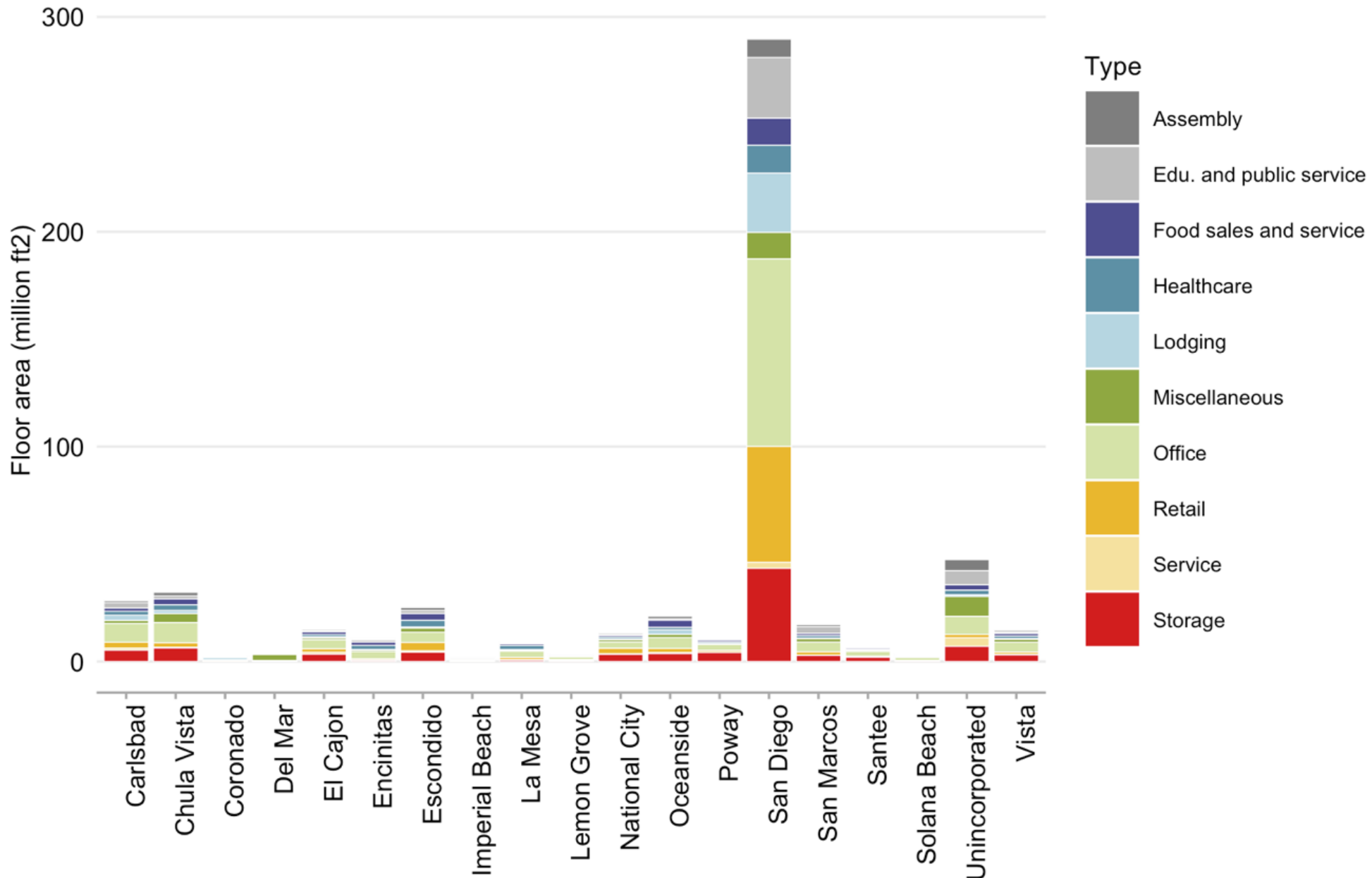
Source: San Diego County Assessor's Office (2021)

# Significant Natural Gas Consumption in Regional Residential Water Heating and Space Heating



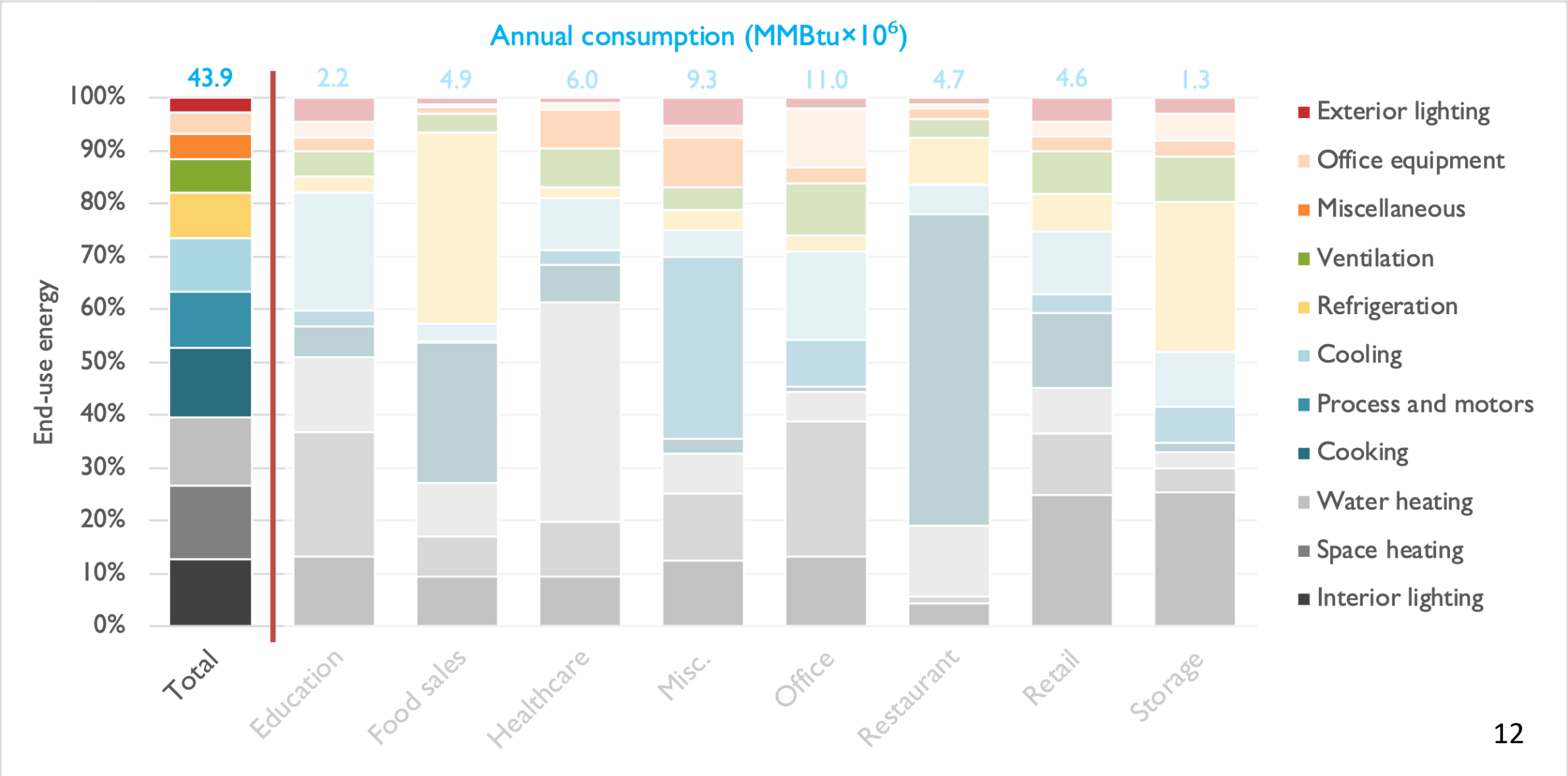
Source: DNV GL Energy Insights (2021). 2019 California Residential Appliance Saturation Study (RASS)

# Regional Commercial Building Space (million square feet)



Source: San Diego County Assessor's Office (2021)

# Significant Energy Consumption in Regional Commercial Water Heating and Space Heating





# Building Sector Modeling Overview

## 1. Central (High Electrification)

- Vast majority of space and water heating sales are electrified by 2030
- Some new gas customers 2030-2050
- Vast majority of installed residential HVAC systems are electric in 2050

## 2. Low Electricity Demand (High Efficiency)

- Same as the Central case, except heat pumps are assumed to perform at higher efficiencies, reducing electricity consumption and demand

## 3. Partial Electrification

- Fewer than half of systems sales are electric by 2030; assumes that “low-carbon fuels” replace natural gas starting in 2030, reaching 100% by 2045

	Central	Low Demand/ High Efficiency	Partial Electrification
Electric space heat equipment <b>sales</b> share in 2030	96% (84% heat pump)	96% (84% heat pump)	41% (17% heat pump)
Electric share of <b>installed</b> residential HVAC systems in 2050	92% (75% heat pump)	92% (75% heat pump)	75% (54% heat pump)
New residential space heating heat pump <b>energy efficiency</b> (COP, coefficient of performance) in 2050	3.51x heat output per unit of energy	5x heat output per unit of energy	3.51x heat output per unit of energy
Residential and commercial <b>electricity consumption</b> from space and water heating in 2050	4.6 TWh	4.2 TWh	4.3 TWh

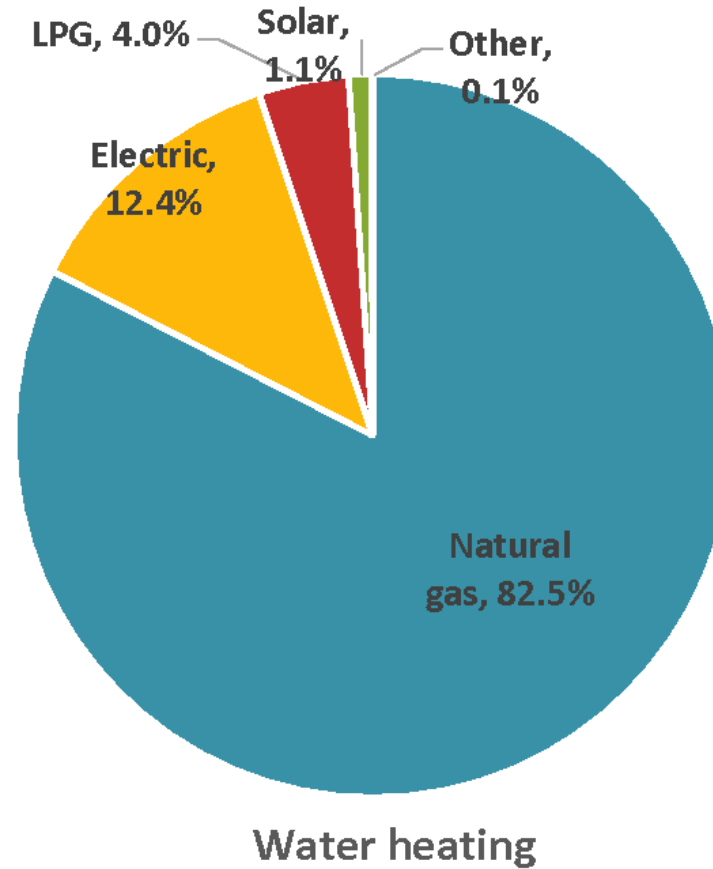
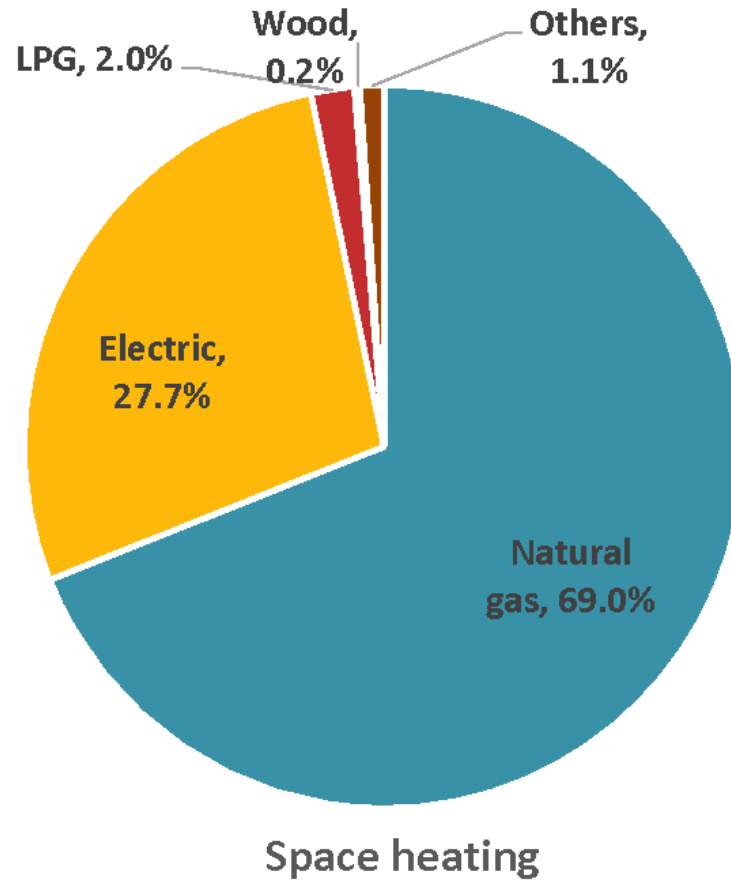
# RDF Technical Report Buildings Chapter



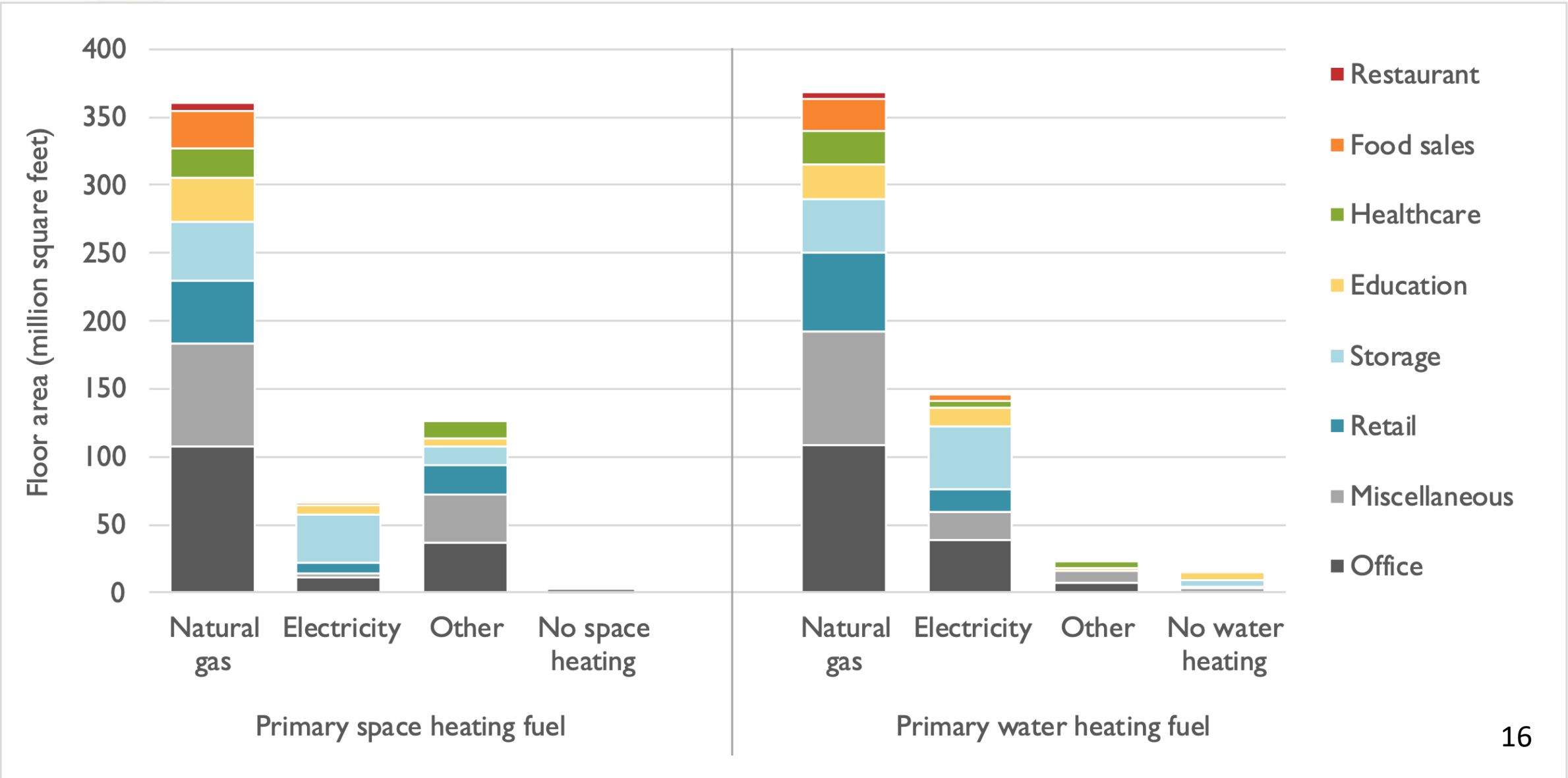
**Synapse**  
Energy Economics, Inc.



# Key Takeaway 1: Replacing Natural Gas Residential Space Heating and Water Heating with Electric Reduces Associated Buildings Emissions



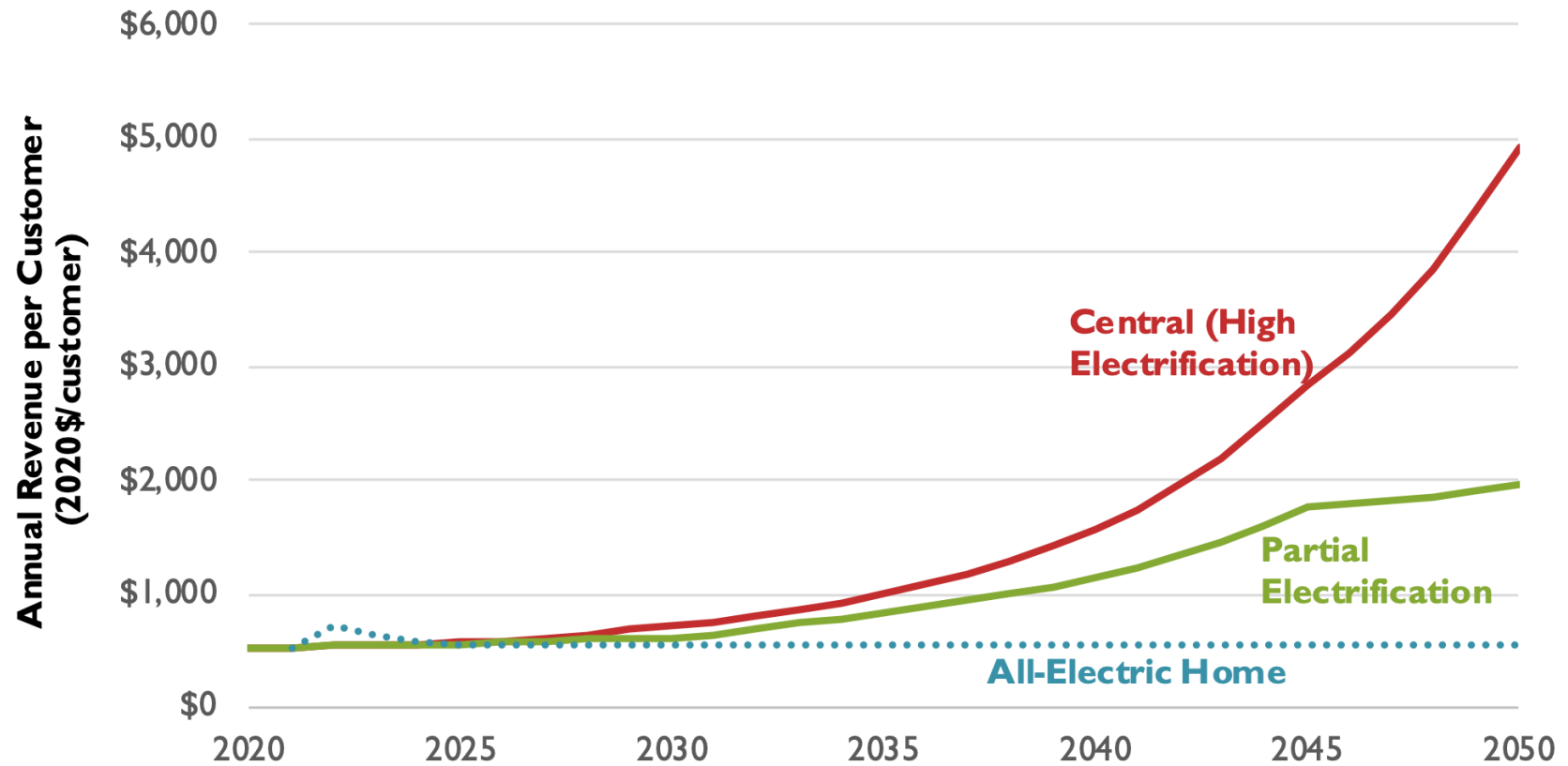
# Key Takeaway 1: Replacing Natural Gas Commercial Space and Water Heating with Electric Reduces Associated Buildings Emissions





## Key Takeaway 2: Policies to Electrify Heating Systems Should Focus on Low-Income Residents and Rental Units

- Central scenario (high electrification, very few gas customers) = highest costs per gas customer
  - ~10x higher from 2020 to 2050
- Partial electrification (relatively more gas customers) = relatively high costs per gas customer
  - ~4x higher from 2020 to 2050
- Late adopters will face increasingly higher costs of gas

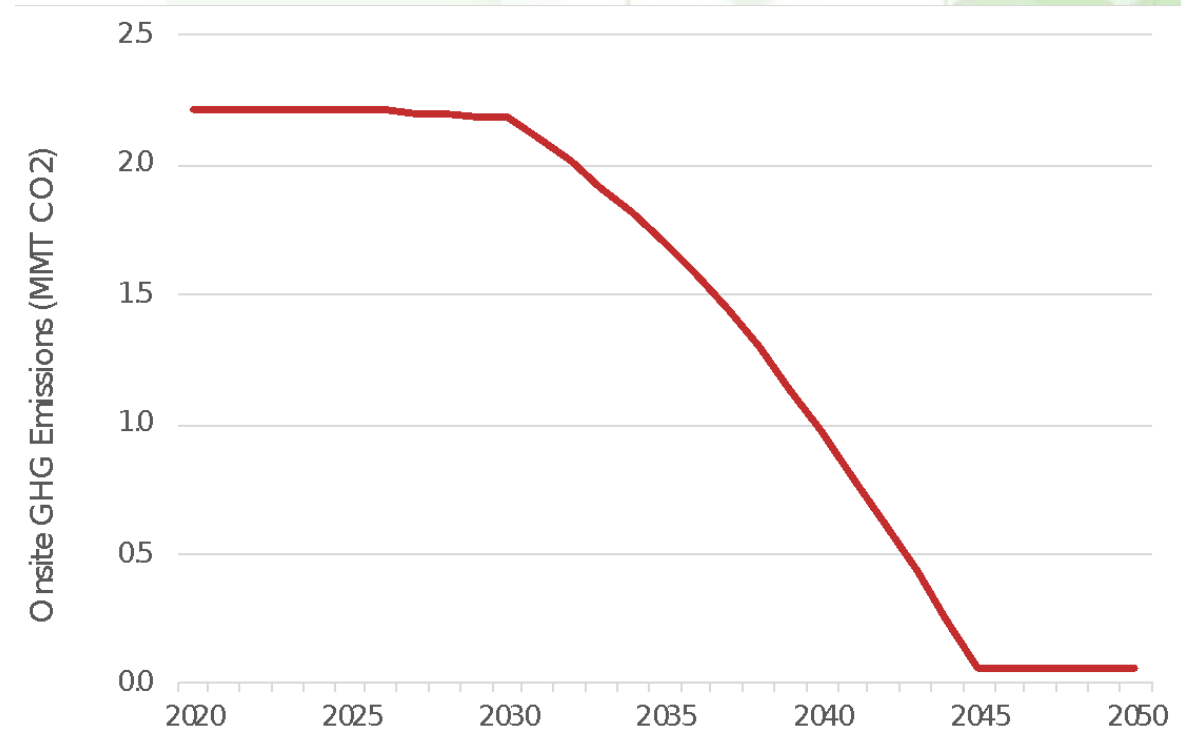
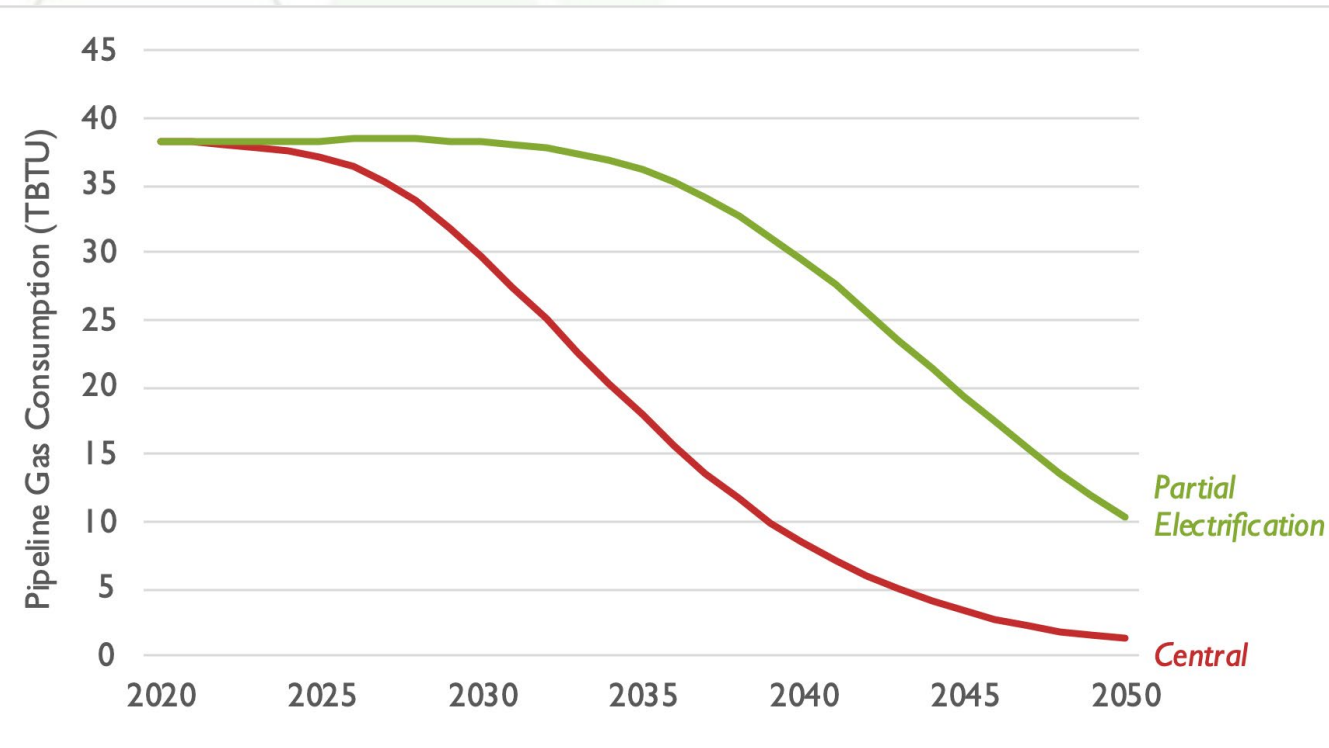


## Key Takeaway 3: Near-Term Actions Include “All-Electric” or “Electric Ready” Building Codes

- State is moving toward all-electric building codes and ordinances
  - 2045 carbon neutrality
- Regional reach codes or ordinances exist in the cities of Carlsbad, Encinitas, and Solana Beach
  - Lessons for other policymakers

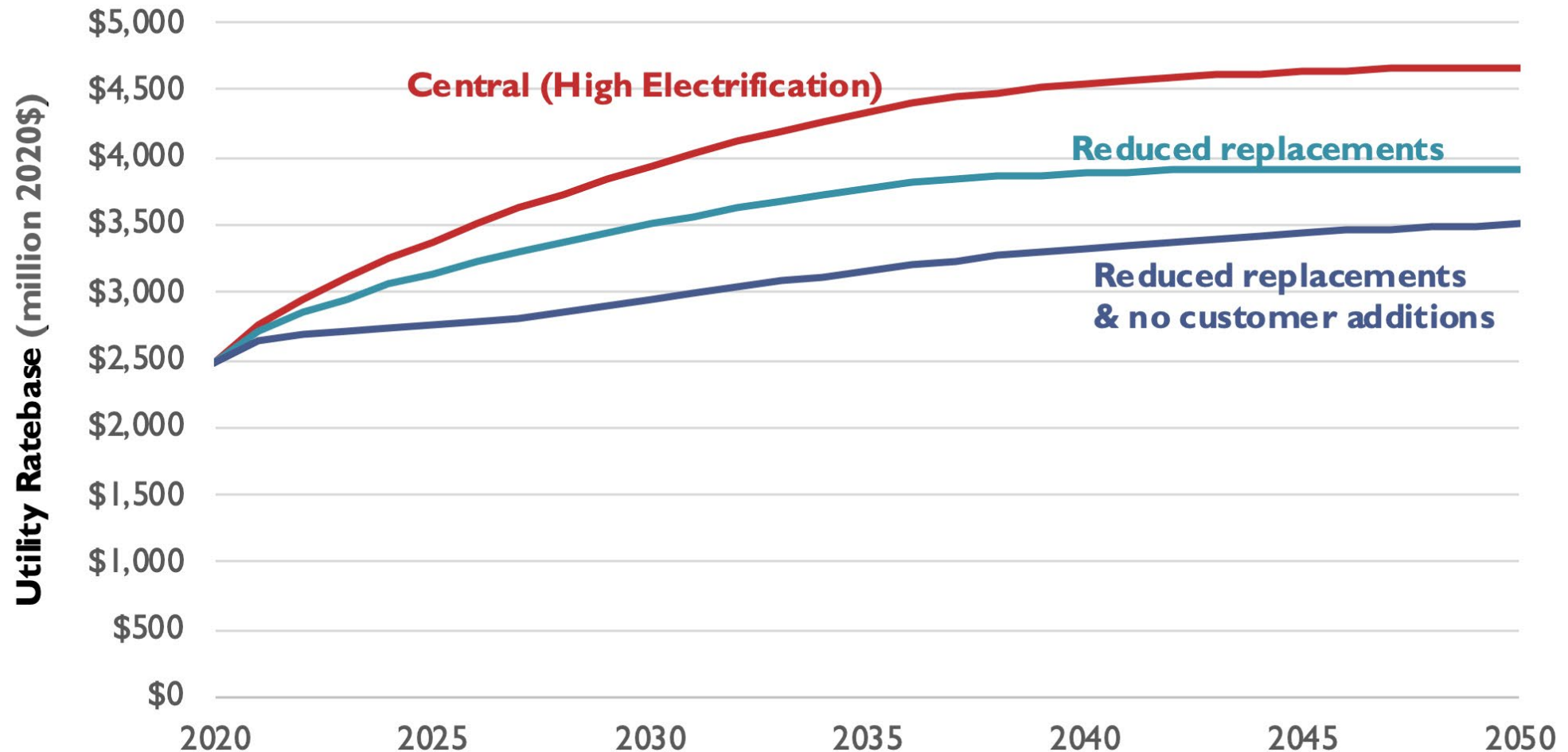


## Key Takeaway 4: Low-Carbon Gaseous Fuels Can Decrease Some Hard-to-Electrify Systems, Though Piloting and Research Are Needed



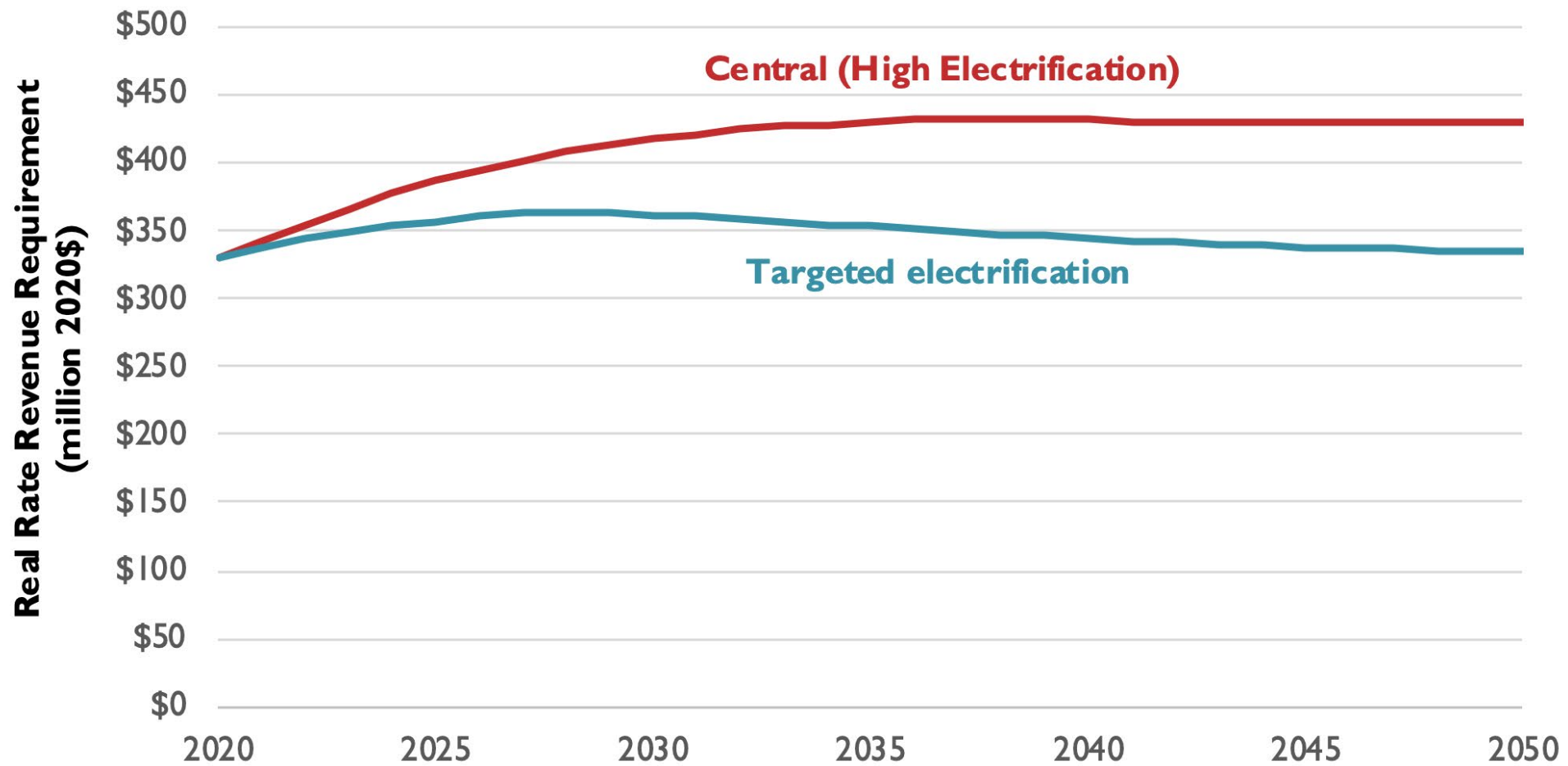
## Key Takeaway 5: Minimizing Unnecessary Natural Gas Infrastructure Extensions or Replacement and Accelerating Existing Asset Depreciation Can Mitigate Gas Utility Risk

1. No new customers
2. Minimize unnecessary extensions or replacements



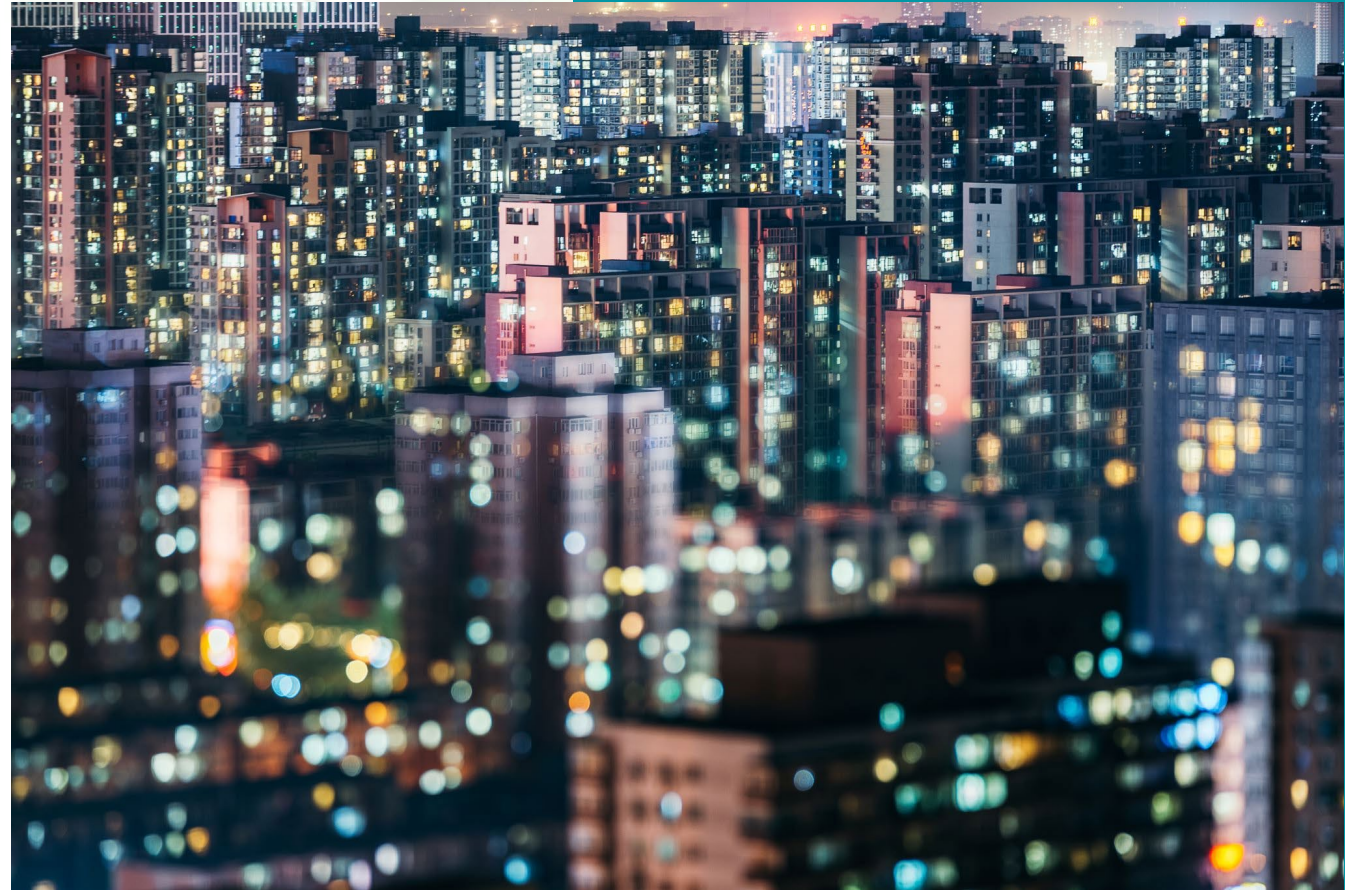


## Key Takeaway 5: Minimizing Unnecessary Natural Gas Infrastructure Extensions or Replacement and Accelerating Existing Asset Depreciation Can Mitigate Gas Utility Risk



## Key Takeaway 6: Decarbonizing Existing Buildings is Critical

- 80% of buildings that will exist in the region in 2050 have already been built
- Replace end-of-life systems
- Decarbonize existing municipal buildings



# Conclusions

- Modeled pathways to zero on-site emissions under three scenarios
- Focused on space and water heating electrification
- Electrification is needed in new and existing buildings
- Electrification policies should focus on equity
- Utility economics helps contextualize building decarbonization costs





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