

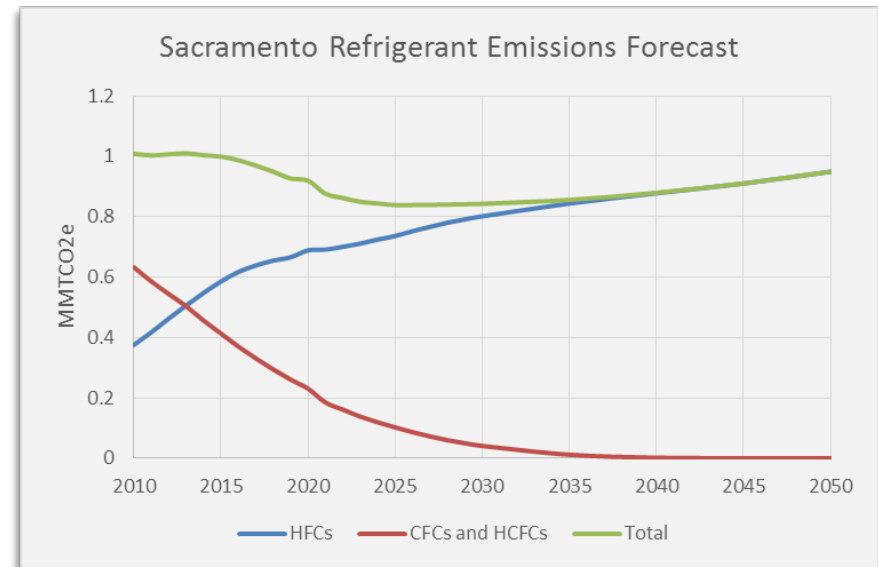
# SMUD's Natural Refrigerant Incentive Program

Promoting Direct GHG Emission Reductions in Commercial Refrigeration

Presented to the NASRC Low-GWP and EE Expo  
January 15, 2020

# Introducing the SMUD Pilot Natural Refrigerant Incentive Program

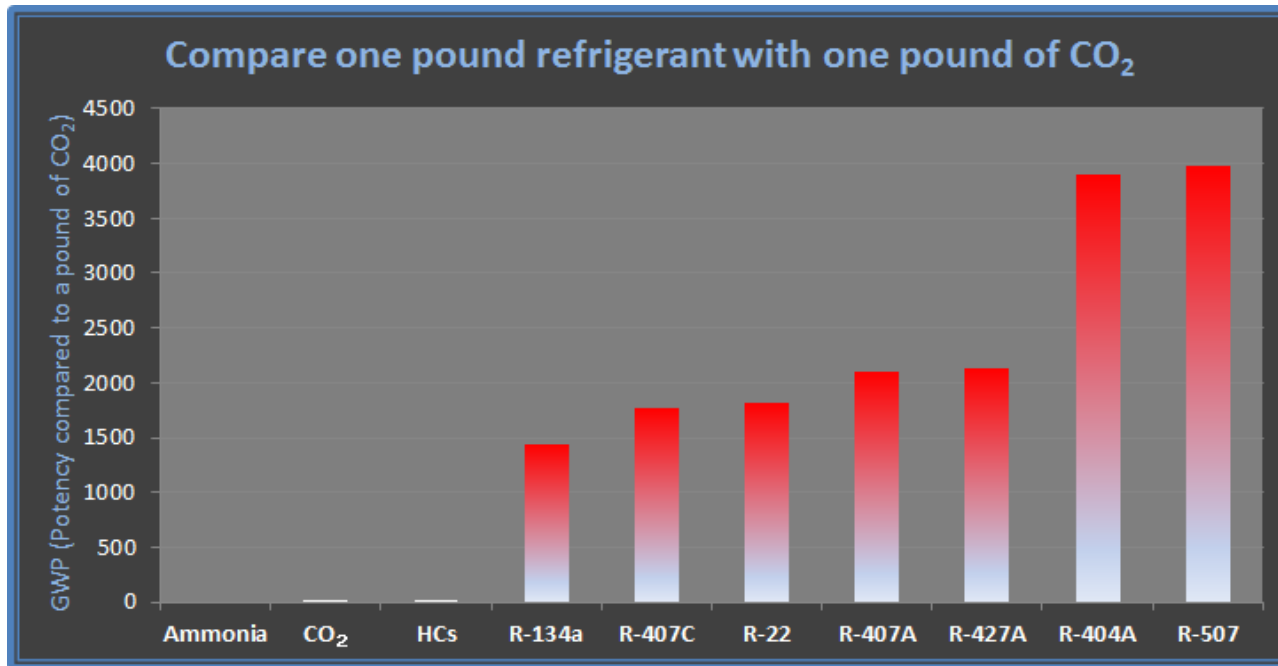
- Builds on SMUD's existing Custom Incentive and Savings By Design programs
  - Maintains incentive for energy (kWh) and demand (kW)
- **Additional incentive for direct GHG emission reductions from new or retrofitted low-GWP systems**
  - SMUD pays for energy performance metering and data collection to understand performance of low-GWP systems



High-GWP refrigerants are projected to result in annual GHG emissions of over 1 million MtCO<sub>2</sub>e in Sacramento alone by 2050

# Natural Refrigerant GHG Benefits

- Direct emissions can be reduced by over 99%
- High-GWP gases have GWPs from 1,500 to 4,000, while natural refrigerants have GWPs that are typically less than 4



# SMUD Program Objectives

- Spur market transformation to support SMUD's Environmental Leadership Directive (SD-7)
- Establish a cost-effective pathway for Natural Refrigerants
- Create a model incentive for others to reference
- Build a network of manufacturers, engineers, technicians, and customers
- Position SMUD to leverage potential state funding on our customer's behalf

*“SMUD will provide leadership in the reduction of the region's total emissions of greenhouse gases through proactive programs in all SMUD activities and development and support of national, State, and regional climate change policies and initiatives.” SMUD Strategic Directive 7*



# Customer Benefits

- **End the expensive cycle** of refrigeration system upgrades and retrofits due to refrigerant phase outs and replacements with a permanent long term solution
- **Assist with the initial cost** of new equipment installation
- **Support emerging technologies** that enable customers to improve energy efficiency and reduce direct GHG reductions
- **Lower customer energy bills and refrigerant costs**
- **Eliminate liability** associated with leak inspections, fines, and enforcements
- **Provide Access** to network of equipment manufacturers, engineers, technicians, and successful project implementations

# Incentive Eligibility and Structure

Program Parameters	Existing Program Requirements	Refrigerant Incentive Requirements
Retrofit	Meet the existing requirements of the Custom Incentive Program	System uses natural refrigerant (CO2, ammonia, hydrocarbon)
New system	Meet the existing requirements of the Savings By Design Program	System uses natural refrigerant (CO2, ammonia, hydrocarbon)
Required system monitoring	None	Three years, SMUD pays installation/integration
Permanent Change	Permanent physical system change required so operation doesn't revert to the baseline technology	Physical system component or change must be made that prevents reverting to high-GWP refrigerant

Custom Program Incentive	Direct GHG Emissions Reductions Incentive
<p>Incentives are based on decreasing your energy use:</p> <ul style="list-style-type: none"> <li>• \$0.10/kWh Energy Reduction Incentive and</li> <li>• \$200/kW Demand Reduction Incentive</li> <li>• Total incentive limited to 30% of project cost or \$150,000, whichever is less</li> </ul>	<p>Incentives are based on decreasing direct emissions from refrigerants over the system lifetime:</p> <ul style="list-style-type: none"> <li>• \$25/MtCO<sub>2</sub>e emissions reduction from refrigerants</li> <li>• Total incentive limited to 30% of project cost or \$150,000, whichever is less</li> </ul> <p>All projects located in disadvantaged communities (with preference for those in the top 10%) and implemented by small-to-medium sized business owners will receive a 25% incentive bonus</p>
<p><b>Combined incentive limited to 50% of project cost or \$250,000, whichever is less</b></p>	



## SMUD Pilot Natural Refrigerant Incentive Process Flow



Customer requests incentive estimate



SMUD calculates and returns to Customer



Customer submits reservation incentive request



SMUD reviews and conducts site visit, authorizes payment

If approved, Customer installs system and coordinates with SMUD for sub-meter installation



SMUD evaluates and rejects or approves, begins coordination of sub-meter installation



### SMUD administers pilot program for up to 3 years

- Prepare and authorize estimates, arrange sub-metering
- Review invoices
- Meet regularly to track program process and operational data
- Monitor data for up to 3 years
- Engage M&V contractors to review projects
- Publish summary report / case studies

# More information available in the SMUD Pilot Natural Incentive Program Summary





# Developing an Appropriate Direct Incentive Rate Level

- Direct incentive rate was evaluated in two ways, both supported a valuation of approximately \$25/MtCO<sub>2</sub>e
  1. Based on SMUD current energy incentives (Custom Incentive and Saving By Design)
    - \$0.10/kWh converted to \$/MtCO<sub>2</sub>e using marginal emission factor for 15 year life
  2. Based on California GHG Allowance Price Floor
    - Average of price floor for 15 years based on annual escalation of 5% plus inflation

# Example of Refrigerant Incentives (excl. energy)

Project Specifications	Example 1 – large centralized system, 1,000 MBtu/hr cooling capacity (new system)	Example 2 – medium centralized system 300 MBtu/hr cooling (retrofit)	Example 3 – Stand Alone Unit (New, small business, disadvantaged Comm.)
Baseline Refrigerant	R-407A	R-407A	R-404A / HFC-134a
Baseline GWP	2,107	2,107	2676
Baseline Charge (lbs.)	2,560	768	1
Baseline Leak Rate (%/year) <sup>3</sup>	20%	20%	8%
Baseline Emissions (MtCO <sub>2</sub> e/year)	490	147	0.05
Natural Refrigerant	R-744 (Carbon Dioxide)	R-744 (Carbon Dioxide)	R-290 (Propane)
Natural Refrigerant GWP	1	1	3
Natural Refrigerant Emissions (MtCO <sub>2</sub> e/year)	0.2	0.1	0
Direct GHG Reduction (MtCO <sub>2</sub> e/year)	490	146	0.1
Direct GHG Incentive (\$/MtCO <sub>2</sub> e)	\$25	\$25	\$25
Bonus Incentive (Small Business, Disadvantaged Community)	0	25%	25%
Equipment Lifetime	15 years	15 years	20 years
Refrigerant Incentive payment (\$)	\$150,000 (\$183,750 is above program cap )	\$68,440 (\$54,750 without bonus)	\$67 (\$53 without bonus)
Lifetime GHG Reduction (MtCO <sub>2</sub> e*15-yr lifetime)	7,337	2,196	2

# Current Status

- Pilot program announced March 30, 2017 at North American Sustainable Refrigeration Council workshop at SMUD headquarters
- Announcement by California Air Resources Board May 11, 2017
- MANY calls from around the State from interested parties (stores, food processors)
  - There is clear demand for similar programs in from other utilities
- Two active projects utilizing the incentive





- Grocery Outlet
  - Store Opening TOMORROW!!!
  - CO<sub>2</sub> Transcritical System
  - Partnership of NASRC/GO/SMUD won \$125K grant from American Public Power Association DEED program
    - SMUD incentives include \$13,294 Savings by Design (Energy & Demand Savings) and \$78,728 NRIP (GHG Reduction)

- Raley's

- Store Opening in March/April
- Ammonia & CO<sub>2</sub> system
- SMUD NRIP incentive \$150,000 + Savings by Design



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