Attachment 1: Description of Emission Reduction Measure Form

Please fill out one form for each emission reduction measure. See instructions in Attachment 2.

Title: Mandating use of 30 lb refillable refrigerant cylinders in the professional service sector

Type of Measure (check all that apply):

- ☒ Direct Regulation
- ☐ Market-Based Compliance
- ☐ Monetary Incentive
- ☐ Non-Monetary Incentive
- ☐ Voluntary
- ☐ Alternative Compliance Mechanism
- ☐ Other Describe:

Responsible Agency: ARB

Sector:

- ☒ Transportation
- ☐ Electricity Generation
- ☒ Other Industrial
- ☐ Refineries
- ☐ Agriculture
- ☐ Cement
- ☐ Sequestration
- ☐ Other Describe:

2020 Baseline Emissions Assumed (MMT CO2E): 0.5 MMT CO2E

Percent Reduction in 2020: 100%

Cost-Effectiveness ($/metric ton CO2E) in 2020:
Not estimated at this time. Cost estimates and assumptions need further refinement.

Description:
The specific refrigerant gas Early Action measures relate to automotive air conditioning and commercial refrigeration equipment design. We strongly believe that the ARB could significantly decrease the amount of environmentally hazardous GHGs released into the atmosphere by expanding its regulations to include the professional servicing of stationary refrigeration and air conditioning equipment, both commercial and residential. The potential for reducing emissions by using refillable refrigerant cylinders in this sector is significantly higher than the automotive sector.

The most commonly used container for refrigerant gases in the professional service sector (both mobile A/C and stationary equipment) today is the 30 lb. disposable cylinder. If the industry used 30 lb. refillable refrigerant cylinders, this would eliminate the unnecessary and harmful emission of the residual product remaining in the 30 lb.

non-refillable, disposable cylinder when it is ultimately (and inevitably) disposed, and decrease the amount of steel being needlessly sent to landfills.

A majority of the developed nations including Canada, the European Union, and Australia have banned the use of non-refillable containers for refrigerant GHGs. Mandating the use of returnable, refillable containers was implemented as a key measure to reduce GHG emissions by eliminating the possibility of the eventual release of the residual product that inevitably remains in disposable refrigerant containers. These regulations had support from the major refrigerant manufacturers and industry trade associations. Banning non-refillable refrigerant cylinders also has the added benefits of increased safety and decreased burden on landfills, which is where virtually all of the cylinders end up. We estimate that nationally up to 200,000 cubic yards of waste, and 30 million pounds of valuable steel could be diverted from landfills each year by banning the 30 lb. disposable refrigerant cylinder.

The industrial gas industry is a mature industry and has a sophisticated distribution network to handle refillable containers both nationally and regionally. The 125 lb. and larger (1000 lb., and 2000 lb.) refillable refrigerant cylinders for industrial applications are standard in the industry today and more suppliers now offer the 30 lb. refillable size. Over ten years ago, a refillable 30 lb. refrigerant cylinder was introduced to the market by Airgas to replace the throw-away, disposable, single-use 30 lb. cylinders. The refrigerant industry uses refillable cylinders of various sizes to transport used, recovered refrigerants back to certified recycling (reclaiming) facilities across the country, so the infrastructure to handle these cylinders is currrently in place.

One of ARB's Early Action Strategies addresses a Refrigerant Tracking, Reporting and Recovery Program that proposes a Deposit/Return Program for the disposable cylinders to encourage recovery of high GWP GHGs. We believe the use of refillable cylinders accomplishes this objective by using the existing industrial gas distribution network to pick up, deliver, and retrieve the cylinders. Another added benefit of transitioning to refillable cylinders is the elimination of the need and the cost to dispose of or recycle the non-refillable cylinder itself.

Emission Reduction Calculations and Assumptions:

We estimate that over three percent (3%) of the refrigerant in each 30 lb. disposable cylinder, approximately 6,000,000 pounds nationally of ODS and GHG refrigerant gases, is vented into the atmosphere annually. While approximately 1 million 30 lb. disposable refrigerant cylinders per year are used nationally in servicing automotive air conditioning systems (based on 2004 data from the SAE Improved Mobile Air Conditioning [I-MAC] Research Program), we estimate that approximately 5 million 30 lb. disposable refrigerant cylinders are used nationally in servicing the stationary refrigeration and A/C equipment sector. The automotive service sector uses R-134a with a GWP of 1300 CO2E; the stationary refrigeration and A/C equipment sector uses R-22 (GWP of 1500 CO2E), as well as R-134a and blends. It is assumed that the lower GWP of R-134a offsets the much higher GWP of current blends (estimated to be

approximately 3000 - 3300 CO2E - as weighted GWP of components) and, therefore, the service sector is evaluated as if it were all R-22. Based on the above, it is conservatively estimated that the national emissions, based on the 2004 data, are 4 million metric tons CO2E.

Using the factor of 0.122059 (ratio of 2004 California population to US population), the emission reduction for California would be approximately 0.5 MMT CO2E.

Cost-Effectiveness Calculation and Assumptions:
There is a cost for the industry to move from a disposable refrigerant cylinder to a refillable cylinder. This is primarily the initial investment in the higher cost cylinder.

A 30 lb. disposable DOT-39 cylinder (with valve) costs in the range of $8-$9. The 30 lb. refillable cylinder (with valve) costs in the range of $45 - $50. The estimated number of refillable cylinders that would be needed to replace the 6 million disposables sold nationally each year varies widely due to the seasonality of sales and inventory-build in the current market. Estimates range from 3 million to 9 million cylinders, or a ratio of 0.5 to 1.5. The refillable cylinders are expected to have an average service life of 20 years. Conservatively then, approximately 5% of the population of cylinders would have to be replaced annually.

Initial cost to manufacturers/suppliers:

30 lb. disposable refrigerant cylinders sold in California:
6 million x 0.122059 = 732,354/year

Annual purchase cost of disposable cylinders:
732,354 x $8.50(avg) = $6.2 million

Initial cash cost to purchase refillable cylinders over a 3 year phase-in period:
732,354 x 1.0 ratio(avg) x $47.5(avg) = $34.8 million (expended over 3 years)
Note: this investment would be amortized over the 20 year life of the cylinders

Annual cash cost for replacement refillable cylinders:
0.05 x 732,354 x 1.0 ratio(avg) x $47.50(avg) =$1.7 million

The investment in cylinder assets by the manufacturers/suppliers would be offset by a cylinder deposit (or in some cases a rental) system customary in the industrial gas industry and existing today for the larger refillable cylinders of refrigerant gases. This deposit also helps ensure the return of the cylinder for refilling, minimizing the population of cylinders necessary to serve a given demand. The deposit amount would typically be in the range of the cost of the cylinder and would be returned to the customer when the cylinder is returned to the supplier. This cylinder deposit system, handled by the suppliers, would avoid a bureaucratic and possibly unwieldy deposit

system that might result under a Deposit/Return Program as proposed in ARB's Early Action Strategy: Refrigerant Tracking, Reporting and Recovery Program.

The return of reusable cylinders for refilling may increase transportation costs over a one-way disposable cylinder. This transportation cost could be minimal, as in the case of a local distributor/refiller who makes local deliveries of full cylinders and picks up empty cylinders for refill on the return trip that is being made anyway. For a supplier using a business model involving multiple regional fill locations, the return transportation costs might involve private or common carrier freight charges. Due to the wide variety of distribution options available to the various suppliers, these additional transportation costs are not known at this time. Nevertheless, any additional transportation costs to be incurred should be similar to the return of a disposable cylinder under a Deposit/Return Program as proposed in ARB's Early Action Strategy: Refrigerant Tracking, Reporting and Recovery Program.

Although the existing industrial gas distribution network has the technology and infrastructure/distribution system to handle refillable containers nationally, as well as regionally and locally, there might be local investment (mainly bulk storage tanks) made by some companies to refill specific refrigerant products. It is not known at this time what the additional industry investment might be, as this is company-specific. It has, therefore, not been estimated.

Essentially all 30 lb disposable cylinders are disposed and not recyled. The reduced cost of waste disposal and landfilling of the disposable cylinder itself has not been taken into consideration, nor has an estimate been made of the value of added safety to waste haulers and at landfill sites from the inadvertent disposal on non-refillable cylinders that still contain pressure.

Implementation Barriers and Ways to Overcome Them:
The larger manufacturers of cylinders in the US have the ability to manufacture both disposable cylinders as well as refillable cylinders. It is recognized that the cylinder, as well as valve, manufacturing industry may have capacity limitations preventing the manufacture of sufficient refillable cylinders and valves within the short term. However, given adequate time to effect a total conversion (2-3 years), the cylinder manufacturers would be able to provide a sufficient number of cylinders.

Potential Impact on Criteria and Toxic Pollutants: Not identified at his time.

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