COMMENTS ON:

California Environmental Protection Agency and California Air Resource Board's Revised Proposed Short-Lived Climate Pollutant Reduction Strategy (November 2016)

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by the

Natural Resources Defense Council (NRDC)

Irene Gutierrez, Clean Energy Attorney, Energy and Transportation Program, NRDC

I. Introduction

Short-lived climate pollutants ("SLCPs") like black carbon, methane, and hydrofluorocarbon refrigerants are powerful climate change forcers, accelerating the pace of global warming and accompanying environmental effects. Consequently, we commend the California Air Resources Board ("ARB") for developing a strategy to reduce SLCP emissions ("SLCP Strategy"). California has long been a beacon of progressive climate and environmental policies, and its leadership is especially important today in ensuring continued progress in reducing SLCP emissions in-state and nationwide.

These comments are submitted on behalf of the Natural Resources Defense Council ("NRDC"), a national nonprofit environmental organization with more than 1.2 million members and online activists. Many of these members and activists live and work in California, and have suffered from the effects of climate change ranging from the state's multi-year drought to increased wildfire risks. Since 1970, NRDC's lawyers, scientists, and other environmental experts have worked to protect the world's natural resources, public health, and the environment. NRDC has offices in New York City, Washington, D.C., Los Angeles, San Francisco, Chicago, and Beijing.

II. Strategies to Reduce Black Carbon Emissions.

Black carbon, fine particulate matter produced by automotive and residential fuel combustion and biomass burning (from sources like wildfires and controlled burns), is a pernicious SLCP.[1] Climate experts classify black carbon as second only to carbon dioxide for its climate-warming effects.[2] The World Health Organization and other organizations have found strong correlations between exposure to black carbon and fine particulate matter and increased mortality and sickness due to cardiovascular and pulmonary ailments.[3] We therefore encourage ARB to move forward with decisive measures to reduce black carbon emissions from both mobile and non-mobile sources.

ARB contends that increasingly stringent mobile source regulations will continue to decrease black carbon emissions from cars and trucks, making non-mobile sources like residential wood combustion, small stationary sources, and the industrial sector, increasingly responsible for the state's share of black carbon emissions.[4] In its proposed SLCP strategy, ARB focuses on

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[1] SLCP Strategy at p. 41.
[2] T.C. Bond, S.J. Doherty, *et. al.*, *Bounding the Role of Black Carbon in the Climate System: A Scientific* Assessment, 118 Journal of Geophysical Research 5380, 5388 (June 2013); *available at http://onlinelibrary.wiley.com/doi/10.1002/jgrd.50171/pdf*.
[3] World Health Organization, *Health Effects of Black* Carbon at vii (2012), *available at* *http://www.euro.who.int/__data/assets/pdf_file/0004/162535/e96541.pdf;* Johanna Lepeule, et. al., *Chronic Exposure to Fine Particles and Mortality*, Environmental Health Perspectives (July 2012), available at: http://ehp.niehs.nih.gov/1104660/; American Lung Association, Particle Pollution, *available at http://www.lung.org/our-initiatives/healthy-air/outdoor/air-pollution/particle-pollution.html*.
[4] SLCP Strategy a p. 50.

encouraging conversion of residential fireplaces and woodstoves to certified wood-burning devices or non-wood heating devices to achieve the needed black carbon reductions.[5]

While ARB's mobile source strategy promises to achieve significant black carbon reductions by 2030, we encourage ARB to develop additional mobile source measures to ensure continued progress. For example, ARB's figures show that off-road mobile sources are currently responsible for 36 percent of black carbon emissions in the state, and ARB projects that off-road mobile sources will be responsible for 24 percent of black carbon emissions by 2030.[6] There are likely additional opportunities to more aggressively reduce emissions from this sector, and we urge ARB to press forward in developing additional reductions measures for sources like small off-road engines, off-highway recreational vehicles, commercial marine vessels, and off-road construction and industrial equipment.[7]

In addition to continuing to develop black carbon emissions reductions measures for mobile sources, we encourage ARB to look to measures utilized in other jurisdictions to reduce emissions from residential wood burning.

In Alaska, where many residents rely on burning wood to provide home heat, the state Department of the Environment developed emissions reductions measures ranging from incentives to replace older wood-burning stoves, education programs to increase awareness of best practices, and other wood burning restrictions.[8] The state implemented an incentive program in 2010 to encourage homeowners to replace wood burning heaters with EPA certified heaters.[9] The program has had high rates of success, and is expected to result in over 4,600 heater replacements by 2019. To complement the incentive program, the state adopted a regulation requiring new wood-fired heating devices installed in nonattainment areas to meet stringent emissions limits.[10] In evaluating the feasibility of such regulations, the state found that there were a number of wood-burning devices already available in the marketplace which complied with the stricter emission standards.[11]

The state of Alaska also engaged in public outreach and education programs, to ensure citizens were informed about best practices for burning and storing wood fuel, and were encouraged to refrain from wood burning on poor air quality days.[12] Since burning moist wood increases

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[5] SLCP Strategy at pp. 54-55.
[6] SLCP Strategy at pp. 45, 50.
[7] See California Air Resources Board, Off-Road Mobile Sources, https://www.arb.ca.gov/msprog/offroad/offroad.htm
[8] See Alaska Department of Environmental Quality, *Amendments to State Air Quality Control Plan: Control Strategies* (September 7, 2016); *available at https://dec.alaska.gov/air/anpms/comm/docs/fbxSIPpm2-5/III.D.5.07-Control_Strategies-Adopted_09.07.16.pdf*
[9] *Id.* at III.D.5.7-4 to 7-5.
[10] *Id.* at III.D.5.7-7 (setting emissions limits for wood-fired heaters, wood and pellet stoves, hydronic heaters.)
[11] *Id.*
[12] *Id.* at III.D.5.7-9.

emissions, the state developed a pilot program to distribute wood moisture meters to residents and a program to work with retailers to label the moisture content of wood for sale.[13] The state also restricts open air burns during the winter season.[14]

ARB could also look to other areas besides regulating mobile sources and reducing wood combustion to push forward black carbon emissions reductions. Weather proofing programs and incentivizing more efficient heating methods are examples of energy saving and efficiency measures that could promote black carbon reductions. For example, the Alaska Housing Finance Corporation manages several energy efficiency programs to reduce heating needs, thereby reducing reliance on wood-fueled heat, which include: rebates to home owners making energy-efficient improvements to their homes, and weatherization and energy efficiency assistance to moderate and low-income households.[15] Similarly, the Regional Technical Forum, which advises utilities in the Pacific Northwest about energy efficiency measures, investigated the potential public health benefits of reduced wood stove use in homes participating in ductless heat pump pilot programs.[16] There may also be other measures, such as investing in research and development of aviation biofuels, which could develop additional avenues for reducing black carbon emissions in the long run.[17]

III. Strategies to Reduce Methane Emissions.

A. Reducing Emissions From The Dairy and Livestock Industry.

We agree with ARB about the pressing need to develop additional methane reduction measures in the dairy and livestock industry, since these industries generate more than 50 percent of the California's methane emissions[18], and thirty percent of the United States' methane emissions.[19]

ARB has proposed several measures with much promise to reduce methane emissions. However, most of ARB's reduction proposals center around developing and incentivizing digester technology[20], and we encourage ARB to invest in reduction measures which provide

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[13] *Id.*at III.D.5.7-10.
[14] *Id.* at III.D.5.7-23.
[15] *Id.* at III.D.5.7-14 to 7-15.
[16] See Regional Technical Forum, *Technical Considerations Around Quantifying the Health Impacts from Changes in Wood Smoke Emissions* (November 18, 2014), *available at* https://nwcouncil.app.box.com/s/uuzj2q255bgjup2l70184x7spuqxfiqf; ABT Associates, *Final Summary of the Methodology and Results of Estimating the Health Impacts of Displacing Wood Heat with Electricity in the Pacific Northwest* (April 6, 2014), *available at*: https://nwcouncil.app.box.com/s/wl6l0l88zl7qm976j1txsxpw2uk8tehu
[17] Massachusetts Institute of Technology, Laboratory for Aviation and the Environment, *available at* http://lae.mit.edu/emissions/; Debbie Hammel, Natural Resources Defense Council, *Cleaner Skies are Friendlier Skies* (June 14, 2016); *available at https://www.nrdc.org/experts/debbie-hammel/cleaner-skies-are-friendlier-skies*
[18] See SLCP Strategy at p. 63.
[19] Environmental Protection Agency, Inventory of U.S. Greenhouse Gas Emissions and Sinks, Methane Emissions; *available at https://www.epa.gov/ghgemissions/overview-greenhouse-gases#methane*
[20] See e.g., SLCP Strategy at p. 71.

alternatives to digesters and factory farm systems. Similarly, ARB's timeline focuses on digester-related grants, regulations, and pilot projects[21], and we encourage ARB to commit to developing other reduction measures (i.e., incentives for pasture-based farming, non-digester manure management) as part of its regulatory timeline. We also encourage ARB to consider economic efficiency when awarding grants and implementing pilot projects, so that the state can support a range of cost-effective projects. Finally, given ARB's ambitious reduction target of 40% dairy methane reductions by 2030, we propose ARB set intermediate reductions targets, such as achieving 10% reductions by 2020 and 25% reductions by 2025, to ensure that the state can meet its reduction goals. We provide some additional comments regarding ARB's specific proposals below.

Incentivizing Use of Digester Technology, Shifts in Digester Technology.

We commend ARB's proposal to move away from flush water lagoon systems for managing manure.[22] Flushwater lagoon systems result in large volumes of waste to manage[23], release more methane than other types of manure management systems[24], and create serious risks of soil and groundwater contamination[25].

ARB has identified installing anaerobic digestion systems as one alternative for reducing methane emissions from the livestock and dairy industry.[26] There are many types of anaerobic digester systems, and we encourage ARB to remain consistent with its stated desire to move away from flush water systems, and incentivize the use of alternate systems like dry digesters, blanket reactors, fixed film digesters, or batch digesters.[27] We also encourage ARB to maintain its commitments to reducing criteria air pollutant emissions, and it should not relax these regulatory standards to encourage digester adoption.

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[21] SLCP Strategy at p. 71.
[22] SLCP Strategy at p. 65.
[23] Penn State Extension. "Anaerobic Digestion: Biogas Production and Odor Reduction From Manure." At 1 and 4. Available at http://extension.psu.edu/natural-resources/energy/waste-to-energy/resources/biogas/projects/g-77 and on file at F&WW. Accessed September 14, 2016.
[24] Wittenberg, K., Boadi, D., (2001) Reducing greenhouse gas emissions from livestock agriculture in Manitoba, A report produced for the Manitoba Climate Change Task Force. Government of Manitoba; Owen, J., E. Kebreab,and W. Silver.2013.Greenhouse Gas Mitigation Opportunities in California Agriculture: Review of Emissions and Mitigation Potential of Animal Manure Management and Land Application of Manure. NI GGMOCA R 6. Durham, NC: Duke University.
[25] SLCP Strategy at p. 65.
[26] SLCP Strategy at p. 66.
[27] United States Environmental Protection Agency, (2012) Case Study Primer for Participant Discussion: Biodigesters and Biogas, Technology Market Summit; US Environmental Protection Agency, (2014a) Anaerobic Digesters.

Other nations have widely adopted anaerobic digester technology – Germany has 6,800 large scale digesters in use[28], Spain treats 10% of its organic waste with anaerobic digestion[29], China and India use digester systems, often at the community level.[30] These jurisdictions could provide examples to ARB for incentive and funding mechanisms, like feed-in tariffs[31], which support implementing digester technology. Given that many digesters in the United States have gone out of operation despite significant initial investments, ARB should carefully study the root causes of such failed projects so that it can improve its financial and other incentives.

Investing in Other Manure-Management Measures.

There are a number of other manure management systems with great potential to reduce methane emissions, and ARB should invest in researching and developing these measures in parallel with its investments in digester technology.

We reiterate the comments we submitted to the SLCP Strategy on May 25, 2016, supporting the use of pasture-based management systems for small and mid-sized dairy farms.[32] ARB flagged the need for further evaluation of pasture-based management, to better understand its benefits, costs and limitations.[33] To assist with ARB's evaluation, we would like to direct its attention to organizations which partner with successful dairy and livestock farms utilizing pasture-based management to reduce greenhouse gas emissions. As referenced in our earlier letter, the Grasslands Alliance has developed a sustainability standard for "Climate-Smart Ranching and Farming," which uses a range of techniques from grazing protocols, feed and breed selection, and land management practices to reduce methane and other greenhouse gas emissions.[34] In addition, the California-based Marin Carbon Project has partnered with the Stemple Creek Ranch, the Straus Dairy, and Corda Ranch, grass-based livestock and dairy ranches, in developing "Carbon Farm Plans" which promote carbon sequestration and sustainable farming practices.[35] Such plans would likely have benefits in reducing methane emissions.

We also encourage ARB to invest in other manure management techniques, such as manure composting or dry-stacking that can be used in conjunction with other manure management systems. Composting manure can involve a combination of techniques, including open air

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[28] International Energy Agency Bioenergy (2011).
[29] Abbasi, T., A Brief History of Anaerobic Digestion and Biogas, Biogas Energy (2012).
[30] *Id.*
[31] Klinkner, B.A. (2014) Anaerobic digesterion as a renewable energy source and waste management technology: What must be done for this technology to realize success in the United States? UMass Law Review 68.

[32] Jonathan Gelbard, Natural Resources Defense Council, *Conversion to Pastured Dairy in the Proposed Short-Lived Climate Pollutant Reduction Strategy* (May 25, 2016); *available at https://www.arb.ca.gov/lispub/comm/bccomdisp.php?listname=slcp2016&comment_num=124&virt_num=112*
[33] SLCP Strategy at p. 66.
[34] http://grasslandsalliance.org/?page_id=150
[35] See Marin Carbon Project, http://www.marincarbonproject.org/carbon-farming/carbon-farm-plans

composting, covering of compost piles, mixing manures with other materials, and aerating compost piles. Composting has been shown to reduce overall greenhouse gas emissions by about 25-45% in dairy and beef systems compared to stacking manure and slurry systems.[36] There are various benefits associated with different composting techniques. Mixing of manures can enable greater aeration which can intensify microbial activity, decrease composting time and greenhouse gas emissions.[37] Compost produced by the process can have a positive effect on crop-yields.[38] Composting is also more cost effective than liquid collection flush systems or anaerobic digester systems, and can save individual farms tens of thousands of dollars in manure management costs.[39] Dry-stacking involves the storage of solid manure and/or bedding packs in a semi-enclosed structure, which some researchers have found resulted in 20% fewer greenhouse gas emissions.[40] Dry-stacking can also reduce the time, labor, and equipment costs associated with other types of manure management practices (i.e., actively turned compost piles).[41]

Strategies for Reducing Enteric Fermentation.

While challenging, developing strategies to reduce enteric fermentation is important, since enteric fermentation represents 20 percent of current methane emissions in California.[42] In addition to reducing climate pollution, enteric fermentation strategies can also provide costs

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[36] Amon, B., Amon, T., Boxberger, J., Alt, C. (2001) Emissions of NH3, N2O and CH4 from dairy cows housed in a farmyard manure tying stall (housing, manure storage, manure spreading). Nutrient Cycling in Agroecosystems 60, 103-113; Pattey, E., Trzcinski, M.K., Desjardins, R.L. (2005) Quantifying the reduction of greenhouse gas emissions as a result of composting dairy and beef cattle manure. Nutrient Cycling in Agroecosystems 72, 173-187; Brown, S., Kruger, C., Subler, S. (2008) Greenhouse gas balance for composting operations. Journal of Environmental Quality 37, 1396-1410; Petersen, S.O., Blanchard, M., Chadwick, D., Del Prado, A., Edouard, N., Mosquera, J., Sommer, S.G. (2013) Manure management for greenhouse gas mitigation. animal 7, 266-282.

[37] Ahn, H.K., Mulbry, W., White, J.W., Kondrad, S.L. (2011) Pile mixing increases greenhouse gas emissions during composting of dairy manure. Bioresource Technology 102, 2904-2909; Amon, B., Amon, T., Boxberger, J., Alt, C. (2001) Emissions of NH3, N2O and CH4 from dairy cows housed in a farmyard manure tying stall (housing, manure storage, manure spreading). Nutrient Cycling in Agroecosystems 60, 103-113; Peigne, J., Girardin, P. (2004) Environmental impacts of farm-scale composting practices. Water Air Soil Pollution 153, 45-68.

[38] Roe, N.E., Cornforth, G.C. (2000) Effects of dairy lot scrapings and composted dairy manure on growth, yield, and profit potential of double cropped vegetables. Compost Science & Utilization 8, 320-327; Killeen, J.A. (2000) Compost Resarch on Wisconsin Organic Farm. BioCycle, 54.

[39] See Grant, A. 2003. Can Dairy Manure by Profitably Composted in Maine? Master's Thesis. University of Maine. Available: http://www.library.umaine.edu/theses/pdf/GrantA2003.pdf; Lazarus, W.F. and M. Rudstrom. 2007. The economics of anaerobic digester operation on a Minnesota dairy farm. Review of Agricultural Economics 29, 349-364; Leuer, E.R., Hyde, J. Richard, T.L. 2008. Investing in methane digesters on Pennsylvania dairy farms: Implications of scale economies and environmental programs. Agricultural and Resource Economics Review 37, 188-203.

[40] Dejun, L., Watson, C.J., Yan, M.J. (2013) A review of nitrous oxide mitigation by farm nitrogen management in temperate grassland-based agriculture. Journal of Environmental Management 128, 893-903.

[41] Solano, M.L., Iriarte, F., Ciria, P., Negro, M.J. (2001) SE--Structure and Environment: Performance Characteristics of Three Aeration Systems in the Composting of Sheep Manure and Straw. Journal of Agricultural Engineering Research 79, 317-329.

[42] SLCP Strategy at p. 56.

savings to farmers, since various studies have linked methane reductions with improved feed efficiency and cost reduction.[43]

While ARB identifies the need for further study of measures to reduce enteric fermentation, it does not identify any specific measures to target.[44] We encourage ARB to commit to developing concrete measures to tackle enteric fermentation, and provide examples of several feed and other management strategies as potential vehicles for reducing emissions:

- ***Breed Selection Strategies*** – Certain cattle breeds produce less methane, and ARB could provide education and incentives to farmers to select breeds producing fewer methane emissions. Such choices could also represent savings to the farmer – studies have shown that feed-efficient cows (i.e., cows with a low "residual feed intake") eat less feed, and produce fewer methane emissions.[45] As part of investigating these alternatives, ARB could also study herd size reduction strategies, with the goal of maintaining productivity while achieving methane emission reductions.

- ***Potential Feed Strategies*** – Changes in dairy and livestock feed could reduce methane production. For example, feeding edible oils like coconut or canola oil to cattle, in addition to other feed, could reduce organic matter fermentation and suppress protozoa contributing to methane production.[46] Additional oil could also be introduced through changing grass mixtures to include grasses with higher-fat content, like perennial ryegrass.[47] Some studies have shown that feeding cattle legumes could also reduce methane production.[48]

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[43] Beauchemin, K.A., Janzen, H.H., Little, S.M., McAllister, T.A., McGinn, S.M. (2010) Lifecycle assessment of greenhouse gas emissions from beef production in western Canada: a case study. Agriculture, Ecosystems and Environment. 103, 371-379; Eckard, R.J., Grainger, C., de Klein, C.A.M. (2010a) Options for the abatement of methane and nitrous oxide from ruminant production: A review. Livestock Science 130, 47-56; Johnson, K.A., Johnson, D.E. (1995) Methane emissions from cattle. Journal of Animal Science 73, 2483-2492; Patra, A.K. (2012) Enteric methane mitigation technologies for ruminant livestock: a synthesis of current research and future directions. Environmental Monitoring Assessment 184, 1929-1952.

[44] SLCP Strategy at p. 70.

[45] Eckard, R.J., Grainger, C., de Klein, C.A.M. (2010) Options for the abatement of methane and nitrous oxide from ruminant production: A review. Livestock Science 130, 47-56; Nkrumah, J.D. et al. (2007) Relationships of feedlot efficiency, performance, and feeding behaviour with metabolic rate, methane production, and energy partioning in beef cattle. Journal of Animal Science 84, 145-153; Buddle, B.M., Denis, M., Attwood, G.T., Altermann, E., Janssen, P.H., Ronimus, R.S., Pinares-Patino, C.S., Muetzel, S., Wedlock, D.N. (2011) Strategies to reduce methane emissions from farmed ruminants grazing on pasture. The Veterinary Journal 188, 11-17

[46] Beauchemin, K.A., Kreuzer, M., O'Mara, F., McAllister, T.A. (2008) Nutritional management for enteric methane abatement: a review. Australian Journal of Experimental Agriculture 48, 21-27; Eckard, R.J., Grainger, C., de Klein, C.A.M. (2010a) Options for the abatement of methane and nitrous oxide from ruminant production: A review. Livestock Science 130, 47-56; Johnson, K.A., Johnson, D.E. (1995) Methane emissions from cattle. Journal of Animal Science 73, 2483-2492; Grainger, C., Clarke, T., Beauchemin, K.A., McGinn, S.M., Eckard, R.J. (2008) Supplementation with whole cottonseed reduces methane emissions and increases milk production of dairy cows offered a forage and cereal grain diet. Australia Journal of Experimental Agriculture 48, 73-76.

[47] Palladino, R.A., O'Donovan, M., Kennedy, E., Murphy, J.J., Boland, T.M., Kenny, D.A. (2009) Fatty acid coposition and nutritive value of twelve cultivars of perennial ryegrass. Grass Forage Science 64, 219-226;

- ***Other Management Strategies*** – Other land and lifecycle management strategies could also reduce methane emissions. Improving pasture quality could lead to improved animal productivity and reduce methane emissions, while providing cost savings to farmers.[49] Lifecycle management strategies – shortening the nursing phase for calves ("cow-calf phase"), or sending cows to feedlots earlier could reduce lifetime methane emissions.[50]

B. Reducing Emissions From Food Waste.

A shocking 40 percent of the food supply in the United States is thrown out and never makes it to the dining table.[51] This represents $165 billion worth of food wasted every year, and contributes to the 18 percent of U.S. methane emissions which come from landfills.[52] Consequently, we support ARB's proposals to divert food waste from landfills, develop financial incentives to support organics diversion, and engage in further study to quantify landfill methane emissions.[53] In particular, we appreciate the focus on soil amendment as an integral part of organics management, and highlight the importance of food rescue and food waste reduction as key to reducing the disposal of organics materials. We provide some additional models for diversion and composting practices, and some suggestions for focal points in ARB's strategic proposal.

NRDC has spearheaded various efforts to reduce food waste and associated methane emissions, which could provide examples to guide ARB's strategic thinking. In a recent paper, *Wasted: How America is Losing Up to 40 Percent of Its Food From Farm to Fork to Landfill*, we outline

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Winichayakul, S., Cookson, R., Scott, R., Zhou, J., Zou, X., Roldan, M., Richardson, K., Roberts, N. (2008) Delivery of grasses with high levels of unsaturated protected fatty acids. Proceedings of the New Zealand Grasslands Association 70, 211-216

[48] McCaughey, W.P., Wittenberg, K., Corrigan, D. (1999) Impact of pasture type on methane production by lactating beef cows. Canadian Journal of Animal Science 79, 221-226; Waghorn, G., Tavendale, M.H., Woodfield, D.R. (2002) Methanogenesis from forages fed to sheep. Proceedings of the New Zealand Grasslands Association 64, 167-171; Hammond, K.J., Muetzel, S., Waghorn, G., Pinares-Patino, C.S., Burke, J.L., Hoskin, S.O. (2009) The variation in methane emissions from sheep and cattle is not explained by the chemical composition of ryegrass. Proceedings of the New Zealand Grasslands Association 69, 174-178.

[49] Beauchemin, *supra*; Boadi, D., Wittenberg, K. (2002) Methane production from dairy and beef heifers fed forages differing in nutrient density using the sulphur hexafluoride (SF6) tracer gas technique. Canadian Journal of Animal Science 82, 201-206; Waghorn, G.C. and D.A. Clark (2006) Greenhouse gas mitigation opportunities with immediate application to pastoral grazing for ruminants. Int. Congre. Ser 1293, 107-110.

[50] Beauchemin, K.A., Janzen, H.H., Little, S.M., McAllister, T.A., McGinn, S.M. (2010) Lifecycle assessment of greenhouse gas emissions from beef production in western Canada: a case study. Agriculture, Ecosystems and Environment. 103, 371-379; Smith, P. et al. (2007) Climate Change2007: Mitigation. Contribution of Working Group III for the Fourth Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge, United Kingdom and New York, NY

[51] Dana Gunders, Natural Resources Defense Council, *Wasted: How America is Losing Up to 40 Percent of Its Food from Farm to Fork to Landfill* (August 2012); *available at https://www.nrdc.org/sites/default/files/wasted-food-IP.pdf*

[52] Source: EPA, https://www.epa.gov/lmop/basic-information-about-landfill-gas

[53] SLCP Strategy at pp. 74-76.

various strategies that state and municipal governments can use to reduce food waste (many of which are already being undertaken in California), including: setting waste reduction goals, improving expiration date labels, supporting food rescue, and improving public awareness.[54] Local governments also have a powerful role to play in reducing food waste, and NRDC has partnered with the city of Nashville, Tennessee to develop strategies to reduce food waste, rescue surplus food, and compost and digest food waste.[55] Private entities like sports stadiums can make important contributions in reducing food waste, and NRDC has prepared a *Guide to Composting at Sports Venues*, which could help inform state-level efforts.[56] Other non-profits working on food waste issues like ReFed also have useful solutions for preventing food waste, recovering and redistributing food, and recycling food waste.[57]

As can be seen from these sources, we believe strongly in reducing food waste and using recovered food to feed more people, and where such recovery is not possible, maximizing the productive uses of food waste. We note that none of the current measures to evaluate progress allow for evaluation of the goal to rescue 20 percent of edible food.[58] In order to evaluate this goal, we suggest addition of a bullet point to ARB's SLCP plan to say "The baseline amount of edible food going to waste throughout the food chain (at farms, packers, manufacturers, distributors, retailers, food service institutions, restaurants, and households) as well as ongoing analysis of food rescue (which could be done through required reporting by food donors)."

Further, we recommend that energy production from organic wastes be accomplished in a way that leaves solid and/or liquid residues suitable for nutrient recycling and/or soil amendments, such as can occur with source-separated feedstocks in processes like anaerobic digestion. These applications are a higher and better use of most organic material (e.g. food scraps) than just extraction of energy (and potential landfill disposal of residues). Additionally, we suggest promoting energy incentives to fund processes that explicitly provide for that type of beneficial use of food waste residues. We ask that ARB remain sensitive to these concerns, and focus on processes which maximize the benefits of recycling food waste.

C. Reducing Emissions From the Oil and Gas/Energy Industry.

With the impending shifts in the federal government, it is crucial for California to demonstrate strong climate leadership and to press forward with measures to reduce methane emissions from the oil and gas industry. We support the regulatory measures proposed by ARB, and encourage staff to think more broadly about implementing additional measures over the coming years.

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[54] Gunders, at pp. 16-17.
[55] https://www.nrdc.org/resources/nashville-food-waste-initiative
[56] Darby Hoover, Natural Resources Defense Council; *Guide to Composting at Sports Venues* (March 2014); *available at https://www.nrdc.org/sites/default/files/sports-venue-composting-guide.pdf*
[57] http://www.refed.com/solution?sort=economic-value-per-ton
[58] See SLCP Strategy at p. 76.

ARB cannot count on recent federal methane rules to achieve future emissions, since they are currently subject to industry lawsuits.[59] With the oil and gas industry (extraction and transportation pipelines) emitting 13 percent of the state's methane emissions[60], and with California serving as the nation's third largest oil producer[61], reducing oil and gas methane emissions will have important in-state and national benefits.

IV. Strategies to Reduce HFC Emissions

Similarly, California should continue developing strong state regulations covering hydrofluorocarbons ("HFCs"). Part of ARB's plan depends on implementation of the Kigali Amendment to the Montreal Protocol[62], agreed in October 2016 and widely supported by governments, environmentalists, and industry alike.[63] California has long pioneered climate regulations and continues to have an important role to play in ensuring continued progress in reducing HFC reductions nationwide.

In particular, California should adopt as state-level regulation EPA's two recent HFC rules issued under the "Significant New Alternatives Policy" (SNAP) Program and its Refrigerant Management rule addressing HFCs. Beyond that, California should adopt additional measures, as described below, as necessary in pursuit of its 2030 HFC emissions reduction target. California's efforts will complement the commitments made by key manufacturers of products containing HFCs to reduce reliance on high global warming potential (GWP) refrigerants,[64] and will advance the US market for climate-friendly alternatives significantly.

We reiterate the comments we submitted on May 26, 2016, providing ARB with potential HFC reduction measures that could be implemented with low administrative and monetary costs, and would contribute to significant HFC reductions:

- ***Prohibitions on High GWP Refrigerants in New Non-Residential Refrigeration*** – In our earlier comments, we supported ARB's proposed limitation of GWP 150 in 2020 for new non-residential refrigeration systems. Non-residential refrigeration systems

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[59] See e.g., http://www.sierraclub.org/planet/2016/08/defending-epa-s-methane-rule-industry-legal-challenges-0; http://www.coloradoindependent.com/162810/blm-methane-rule-lawsuit

[60] See SLCP Strategy at p. 56.

[61] See United States Energy Information Administration, http://www.eia.gov/state/?sid=CA

[62] SLCP Strategy at p. 85.

[63] See White House; Fact Sheet: Leaders from 100+ Countries Call for Ambitious Amendment to the Montreal Protocol to Phase Down HFCs and Donors Announce Intent to Provide $80 Million of Support; available at https://www.whitehouse.gov/the-press-office/2016/09/22/leaders-100-countries-call-ambitious-amendment-montreal-protocol-phase

[64] See White House; *Fact Sheet: Obama Administration and Private-Sector Leaders Announce Ambitious Commitments and Robust Progress to Address Potent Greenhouse Gases*; *available at https://www.whitehouse.gov/the-press-office/2015/10/15/fact-sheet-obama-administration-and-private-sector-leaders-announce*

have fewer barriers to low-GWP solutions than other sectors; for example, the Climate and Clean Air Coalition (CCAC) has conducted numerous case studies on designing new and retrofit commercial systems without high-GWP HFCs. Time after time, studies demonstrate that more-efficient, lower-GWP solutions may be installed successfully in a wide range of commercial applications.[65]

- ***Prohibitions on High GWP Refrigerants in Air Conditioning Systems*** – We support an ARB prohibition on high-GWP refrigerants (>750 GWP) in all types of air conditioning effective 2021. Strong California regulations have the potential to move the market – several manufacturers have targeted 2023 as the year for introducing air conditioning products with A2L refrigerants, and increased demand in California (created by ARB regulations and/or updated building codes), could increase demand for these products. For other technologies, like commercial chillers, there are already products on the market that meet a stronger GWP standard.[66]

- ***Prohibitions on High GWP Refrigerants in Home Refrigerators*** – We continue to support ARB's prohibition on refrigerants with GWP > 150 in home refrigerators by 2021. A less-than-150 requirement would push national manufacturers to adopt low-GWP refrigerants like isobutane rather than less-efficient, higher-GWP HFO/HFC blends still permitted by EPA in refrigerators and freezers. However, California should not rely on regulatory advances at the federal level to support this switch.

- ***Developing a List of Products Using Low GWP Alternatives*** – It is important for consumers to have a mechanism for readily identifying next-generation, low GWP technology, and we repeat our earlier recommendation to develop a web-based database to assist consumers in identifying environmentally-responsible choices.

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[65] Low-GWP Alternatives in Commercial Refrigeration: Propane, CO2 and HFO Case Studies. UNEP, 2014. http://www.ccacoalition.org/en/resources/low-gwp-alternatives-commercial-refrigeration-propane-co2-andhfo-case-studies

[66] Johnson Controls Advances Environmental Sustainability with Chiller Platforms Compatible with Low GWP Refrigerants. Johnson Controls, January 20, 2016. http://www.johnsoncontrols.com/media-center/news/pressreleases/2016/01/20/advanced-environmental-sustainability-with-chiller-platforms-compatible-with-lowgwp-refrigerants; Obama Administration and Private-Sector Leaders Announce Ambitious Commitments and Robust Progress to Address Potent Greenhouse Gases. Office of the Press Secretary, October 15, 2015. https://www.whitehouse.gov/the-press-office/2015/10/15/fact-sheet-obama-administration-and-privatesector-leaders-announce

V. Conclusion.

We appreciate the opportunity to comment on ARB's proposed SLCP strategy, and should you have any questions or require any further information, please do not hesitate to contact us at 415.875.6100 or igutierrez@nrdc.org.

Sincerely,

Irene V. Gutierrez
Clean Energy Attorney, NRDC