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MODEL REGULATION TO CONTROL NITROUS OXIDE EMISSIONS FROM LARGE COMMERCIAL FARMS

I. Introduction and Summary of Model Regulation

This model regulation is designed to control emissions of nitrous oxide (N_2O) from large commercial crop farms to reduce impacts of N_2O pollution to the stratospheric ozone layer. The regulation establishes a program that requires development and implementation of farm-specific nitrogen management plans, prepared based on field and crop specific conditions by a certified nitrogen management planner. Plans must include nitrogen application rate targets calculated at the field and crop level, accounting for application of best management practices and cover crops. The program includes training and continuing education elements for planners, along with recordkeeping and reporting requirements for commercial farms.

As detailed below, the regulation is structured with a number of leverage points that can be modified to expand the scope or binding nature of different regulatory components. For example, as presently drafted, the applicability threshold is set through definition of the term "commercial farm" which is not triggered unless a farm is both greater than 1,000 acres in size and grosses more than $1,000,000 per year. These levels can be easily modified. Likewise, nitrogen application rate targets are currently structured to be non-binding, so long as the farm implements the minimum core strategy of planting off-season cover crops. The nitrogen application rate target, which accounts for application of site-specific best management practices, could be converted to a binding limit in the future through subsequent regulatory amendments as program data is collected and effectiveness of the existing program is assessed.

This plan-based regulatory framework has analogous precedent at the state and federal level and provides an appropriate structure to drive significant N_2O emission reductions at commercial farms while providing maximum flexibility to farmers. It draws from nutrient management programs implemented by the states of Maryland, Delaware and Virginia,[1] as well as plan requirements applicable to Concentrated Animal Feeding Operations (CAFOs) under the federal Clean Water Act (CWA) National Pollutant Discharge Elimination System (NPDES) permit program.[2] While these programs are primarily targeted at reducing pollution to water from a range of nutrients, many of the same principles and measures are effective at reducing N_2O emissions to the air as well. Plan-based frameworks such as these are particularly useful regulatory structures where site-specific factors dictate what measures will be most effective at achieving the regulatory goal.

[1] *See generally* Maryland Dep't of Agriculture, Agricultural Nutrient Management Program, https://mda.maryland.gov/resource_conservation/Pages/farmer_information.aspx; Delaware Dep't of Agriculture, Nutrient Management, https://agriculture.delaware.gov/nutrient-management/; Virginia Dep't of Conservation and Recreation, Virginia's Nutrient Management Program, https://www.dcr.virginia.gov/soil-and-water/nutmgt.

[2] 40 C.F.R. 122.42(e).

Here, the regulatory goal is to minimize emissions of nitrous oxide in order to reduce impacts to the stratospheric ozone layer – the most abundantly emitted ozone-depleting substance in the United States and globally, even after accounting for its relatively low ozone-depleting potential.[3] Agricultural soil management is in turn responsible for the overwhelming majority of N_2O emissions in the United States at approximately 73 percent.[4] Despite the scale and significance of these emissions, nitrous oxide is not well suited to regulation under the primary CAA framework for ozone-depleting substances, which is premised upon a phase out of production and consumption of chemicals used in specific industrial applications.[5] The plan-based regulation proposed here is designed instead for adoption by EPA under section 615 of the CAA.[6] Alternatively, with minor modifications, the regulation can be adopted as a statute or regulation at the state or federal level.

II. Legal Authority under the Clean Air Act and Other Laws

Section 615 of the Clean Air Act provides EPA with an alternative source of statutory authority for regulating substances or actions which may impact the stratospheric ozone layer.[7] Specifically, it provides:

> If, in the Administrator's judgement, any substance, practice, process, or activity may reasonably be anticipated to affect the stratosphere, especially ozone in the stratosphere, and such effect may reasonably be anticipated to endanger public health or welfare, the Administrator shall promptly promulgate regulations respecting the control of such substance, practice, process, or activity, and shall submit notice of the proposal and promulgation of such regulation to Congress.[8]

Adoption of nitrogen management regulations under this provision would require EPA to make an endangerment finding with respect to either nitrous oxide as a substance, or the practices, processes and activities at commercial farms that result in nitrous oxide emissions. The procedural steps and scientific analysis associated with issuing an endangerment finding under section 615 are not further addressed here. It is nonetheless notable that the authority granted to EPA under 615 is on its face broad, flexible and would seem particularly well-suited for addressing an ozone-depleting

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[3] A. R. Ravishankara, J. S. Daniel, R. W. Portman, *Nitrous Oxide (N2O): The Dominant Ozone-Depleting Substance Emitted in the 21st Century,* Science, Vol. 326, Issue 5949, 123-125 (Oct. 2, 2009), https://science.sciencemag.org/content/326/5949/123.full.

[4] J. Wentz & D. Kanter, Legal Pathways to Deep Decarbonization in the United States, Ch. 35 Nitrous Oxide, at 918 (2019).

[5] *See* Clean Air Act §§ 602-605.

[6] 42 U.S.C. § 7671n.

[7] *See generally* Congressional Research Service, Nitrous Oxide from Agricultural Sources: Potential Role in Greenhouse Gas Emission Reduction and Ozone Recovery, at 8 (May 3, 2010), https://perma.cc/L7RL-PUTF (discussing potential use of 615 to regulate nitrous oxide from agricultural sources).

[8] 42 U.S.C. § 7671n.

substance such as nitrous oxide that is emitted in significant quantities from diffuse sources and activities, and therefore a poor fit for the CAA's primary regulatory vehicle for addressing pollutants that impact the stratospheric ozone layer.[9]

An alternative source of authority for this regulation under the CAA is section 115, which relates to international air pollution.[10] The central requirements under section 115 are that the Administrator first issue an endangerment finding that air pollutants in the US endanger public health in a foreign country, and, second, make a reciprocity finding that the endangered foreign country gives the same rights with respect to the control of its own air pollution as is provided by § 115. Since any efforts to deploy section 115 are likely to apply broadly to all greenhouse gas emissions, rather than nitrous oxide specifically, use of this statutory authority is outside of the scope of this memo.[11]

Outside of the Clean Air Act, the model regulation would also be well suited for adoption at the state level as a stand-alone statutory or regulatory program. Because the model regulation achieves many co-benefits, the same framework could be deployed towards different policy ends by a state, whether ozone depletion, climate change, or related co-benefits such as improvements to surface and ground water quality.

III. Precedent for Plan-Based Regulation at Farms

The model regulation is inspired by the nutrient management programs implemented by the states of Maryland, Delaware, and Virginia. These programs require most farms and livestock operations to follow site-specific *nutrient* management plans when managing their operations in order to reduce nutrient run-off to Chesapeake Bay and associated waterways, which have historically been severely impacted by phosphorous and nitrogen pollution from surrounding farms.[12] In particular, the model regulation draws from the program implemented by the state of Maryland, which for over two decades has required farmers to develop and implement nutrient management plans with

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[9] During the second term of the Obama Administration in 2013, a petition for rulemaking under this section of the CAA (among others) was filed advocating for EPA to evaluate the impact of nitrous oxide and other substances on the stratosphere under this provision and issue regulations controlling their emissions. *See* Institute for Policy Integrity, Petition for Rulemakings and Call for Information under Section 115, Title VI, Section 11, and Title II of the Clean Air Act to Regulate Greenhouse Gas Emissions (Feb. 19, 2013).

[10] 42 U.S.C. § 7415.

[11] *See generally* Michael Burger et al., *Legal Pathways to Reducing Greenhouse Gas Emissions Under Section 115 of the Clean Air Act*, 28 Geo. Envtl. L. Rev. 359 (2016), http://columbiaclimatelaw.com/files/2016/06/Burger-et-al.-2016-01-Reduce-GHG-Emissions-Under-Section-115-of-CAA.pdf.

[12] *See generally* Maryland Dep't of Agriculture, Agricultural Nutrient Management Program, https://mda.maryland.gov/resource_conservation/Pages/farmer_information.aspx; Delaware Dep't of Agriculture, Nutrient Management, https://agriculture.delaware.gov/nutrient-management/; Virginia Dep't of Conservation and Recreation, Virginia's Nutrient Management Program, https://www.dcr.virginia.gov/soil-and-water/nutmgt.

the dual goals of optimizing crop yields and reducing environmental losses.[13] The plans must be prepared based on a site-specific assessment by a certified expert, who helps determine plant nutrient needs, realistic yield goals and maximum nutrient application rates, based on testing of soil and assessment of how different management strategies impact the need for fertilizer application.[14] The program includes a training component for certified experts as well as reporting components.

While these state-level programs are targeted primarily at reducing impacts to water, the same principles and many of the same methods are effective at reducing emissions of nitrous oxide to the air, which at commercial farms are caused primarily by microbial conversion of nitrogen compounds that are applied to the soil. Use of cover crops and implementation of "4Rs" strategies for nutrient stewardship (right time, place, source, and rate) can reduce the total nitrogen load applied to crop land by maximizing crop uptake and improving soil health and stability, which reduces both nitrous oxide emissions to the atmosphere and leaching of excess nitrogen to ground and surface waters (and subsequent atmospheric release). These strategies are not aimed at reducing crop yield, but are intended to maximize the value of nitrogen – itself a costly input – that is applied.

Plan-based frameworks are also commonly applied by EPA where site-specific factors dictate which measures will be most effective at achieving the regulatory goal. Nutrient management plans have been long required for CAFOs regulated under the CWA NPDES program.[15] As detailed below, the model regulation contemplates occasional overlap with these CAFO-specific plan requirements, and provides a pathway for farms to jointly address both sets of regulatory requirements when necessary. EPA and states likewise require implementation of Stormwater Pollution Prevention Plans (SWPPPs) in connection with general NPDES permits issued under the CWA to control stormwater from diverse facilities.[16] Another notable example is risk management plans (RMPs) prepared based on facility-specific concerns under EPA's Part 68 regulations.[17]

IV. Conceptual Overview of Model Nitrogen Management Plan Regulation

As outlined above, the model regulation is a plan-based framework for driving significant reductions of nitrous oxide emissions from large commercial farms while maximizing flexibility for farmers, without negatively impacting crop yields. Foundationally, the regulation is structured

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[13] *See* Maryland Nutrient Management Law (Md. Agriculture Code §§ 8-801 *et seq.*); Maryland Nutrient Management Regulations (COMAR 15.20.04, 15.20.05, 15.20.06, 15.20.07, 15.20.08; and 15.20.10), *available at*: https://mda.maryland.gov/resource_conservation/Pages/nutrient_management_overview.aspx.

[14] *See generally* Maryland Dep't of Agriculture, Agricultural Nutrient Management Program, https://mda.maryland.gov/resource_conservation/Pages/farmer_information.aspx (providing overview and resources detailing operation and history of Maryland program).

[15] 40 C.F.R. 122.42(e).

[16] *See, e.g.*, EPA 2015 NPDES Multi-Sector General Permit for Stormwater Discharges Associated with Industrial Activity (MSGP) § 5 (requiring preparation of SWPPP).

[17] 40 CFR Subpart G - Risk Management Plan (§§ 68.150 - 68.195).

to apply to large commercial farms only, i.e., farms with substantial resources and scale that are well-positioned to implement nitrogen management best practices with minimal financial impact. Doing so is also intended to strike a balance between maximizing regulatory coverage of crop land, while minimizing the total number of entities subject to the program to reduce regulatory burdens. With thresholds of 1,000 acres and $1,000,000 in revenue, the definition of "commercial farm" captures well over half of U.S. cropland but only approximately 5 percent of farms in the United States.[18] As large farming operations continue to grow larger, the total percentage of crop land captured by the definition will also continue to incrementally expand. The definition could also be simplified by removing the economic component.

The heart of the model regulation is the requirement that covered farms develop and implement nitrogen management plans. These plans must be developed by certified individuals who have completed an EPA-approved training course and then complete ongoing continuing education over time to maintain their certification. The idea is that an outside expert will visit the farm, develop an understanding of how the farm operates through direct interaction with the farmer, take soil and manure samples if applicable, and then work with the farmer to develop a series of best management practice recommendations tailored to the specific farm. Based on application of these recommendations, and with an understanding of historic yields and crops planted by the farmer, the consultant will calculate a nitrogen application rate target. This target will quantify how must nitrogen application could be reduced *if* such recommendations were employed.

At the outset of the program and as the model regulation is currently drafted, these recommendations are primarily intended to be non-binding and advisory in nature, much in the same way large businesses hire outside consultants to provide advice and recommendations on how to more efficiently operate. Use of cover crops, however, is treated differently, functioning as a quasi-mandatory core strategy that farms are strongly incentivized to apply. As the regulation is structured, if a farm *does not* apply the minimum strategy of cover crops in the preceding off-season, the nitrogen application rate target in its plan is treated as binding. The idea is that so long as the minimum core strategy of cover cropping is applied, farmers have a safe harbor from meeting their rate target. This flexibility is essential, especially in the early years of the program, as farmers, consultants, and EPA assess how the program is functioning, where improvements are needed, and whether sufficient progress is being made from an emissions perspective such that no further elements need be made mandatory. Making such a rate target mandatory in the first instance would create an adversarial relationship between farmer and planner, the opposite of what is essential for such practices to be adopted and applied with care - trust.

A considerable portion of the model regulation sets forth educational requirements for individuals that wish to obtain and retain certification to prepare plans. The regulation also details accreditation standards for entities to meet that wish to offer these educational programs and courses to prospective planners. The intent of these provisions is to delegate and decentralize these functions to professionals that have direct contact and trust with farmers, such as local consultants and educational institutions, rather than EPA. This is consistent with how the Maryland program operates, with significant involvement of the University of Maryland.

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[18] *See* USDA, Farm Size and the Organization of U.S. Crop Farming (Aug. 2013), https://www.ers.usda.gov/webdocs/publications/45108/39359_err152.pdf.

V. Purpose, Rationale, and Alternative Considerations for Each Section

For illustrative purposes, the model regulation is numbered based on its potential placement within Part 82 of EPA's Title 40 regulations. This section details the rationale behind each section and particular leverage points where regulators can make adjustments.

Section 82.400 Purpose. This section describes the policy objective driving the regulation. This objective is to reduce impacts to the stratospheric ozone layer from nitrous oxide emitted by large commercial farms. While it is appropriate for EPA to recognize the numerous co-benefits of this regulation in any cost-benefit analysis, it is important that EPA be precise about the regulatory concern this regulation is designed to address: ozone depletion.

Section 82.401 Definitions. This section includes a number of key definitions that have importance within the regulation, including the definitions of the terms "commercial farm," "farm," and "farmer."

- "Commercial farm" functions as the applicability threshold for the regulation, setting size and income criteria which must be met in order for a farm to be regulated. These levels can be easily adjusted here to carry through the rest of the regulation.

- "Farm" is defined as agricultural land limited to production of crops, with the intention to exclude agricultural land used primarily for pasture or production of animal products. The definition also embeds principles from other CAA programs to prevent opportunities for circumvention by providing that contiguous and adjacent properties under the control of the same person, or persons under common control, constitute part of the same farm.

- "Farmer" is designed to embed principles of operational control that are prevalent throughout CAA regulation programs. It also adds a "tie-breaker" clause for circumstances where multiple entities may meet the definition of "farmer" for a particular farm, providing that the entity that holds the crop insurance policy for the farm is the farmer for the purposes of the regulation.

Section 82.402 Applicability. This section pulls in the definition of commercial farm and sets forth deadlines for when the provisions of the regulation, i.e., plan development and implementation, are triggered. It provides an initial two year window prior to effectiveness in order to allow time for educational programs to be developed and prospective planners to be certified. It also provides a pathway for commercial farms to exist the regulatory program once they fall below the "commercial farm" threshold or permanently cease farming activities.

Section 82.403 General Requirements. This section sets forth in succinct terms the overall requirements that commercial farms are subject to, with more complex regulatory requirements addressed in more detail in subsequent sections. This includes the core regulatory mandates of having a plan in place and registering the commercial farm with the agency. Other important elements include:

- Subsection (c) sets forth explicitly that the nitrogen rate target included in each plan is non-binding provided that cover crops are planted in the preceding off-season. It also provides explicitly that the target becomes a binding limit if cover crops are not planted. Should the regulator wish to modify the enforceability of the rate target, that can be accomplished through modification of this subsection. The planting of cover crops can also be converted into a fully non-binding recommendation as well through modifications to this section and section 82.404(e).

- Subsection (e) provides the plan maintenance schedule, currently drafted to require amendment or update every two years or when major changes or new information is received that renders the existing plan inadequate. This interval could be made less frequent, e.g., every three years, or more frequent.

- Subsection (f) sets forth reporting and recordkeeping obligations of the commercial farm. It is through this mechanism – filing an annual plan implementation report electronically – that EPA will obtain data regarding how the program is functioning and whether progress is being achieved through the best management practices recommended in the plan. It also includes a requirement to document that cover crops were planted in the preceding off-season.

Section 82.404 Core Plan Elements. This section sets forth regulatory instructions for certified nitrogen management planners to follow in preparing plans and performing related duties, as well as other requirements applicable to plans more generally. These core elements are each discussed below:

- Subsection (b) defines how nitrogen application rate targets shall be calculated on each field. This requires the planner to account for a number of inputs, including the crop and realistic yield goal, the composition and nitrogen content of the soil based on testing, and the impact of cover crops and best management practices selected by the planner on nitrogen fertilizer needs. It also includes margin of error bonus, currently set at 10 percent, to account for uncertainties in the accuracy of the rate target (at least in initial years while the program develops).

- Subsection (c) establishes how realistic yield goals shall be calculated. As farmers are likely to seek higher levels, this section greatly limits planner discretion, requiring the yield goal be set based on historic levels.

- Subsection (d) sets forth the requirements for ongoing soil analysis and testing, the results of which are set to remain valid for two years. Testing requirements are also addressed here for manure, to the extent it is applied to fields. As a form of nitrogen fertilizer, a representative sample of the manure must be tested to determine nitrogen content.

- Subsection (e) describes the requirement for cover crops. Planners are encouraged to work with farmers in informing and recommending appropriate cover crops and cover crop blends to meet farmer objectives, including economic objectives. Provision is also

made for crops where cover crops are not feasible due to the nature of cash crop (e.g., cranberries).

- Subsection (f) provides guidance to planners on identifying appropriate best management practices. Primarily these target implementation of the 4Rs on individual farms, but also suggest other special strategies that may have application on only a subset of farms (e.g., crop rotation, micro-irrigation).

- Subsection (g) provides that each plan must be signed by both the planner and the farmer with appropriate attestations from each.

Section 82.405 Plan Structure and Content. This section provides formatting and content requirements for finalized plans delivered to farmers. Primarily, this includes general information regarding the farm and administration of the plan, as well as a summary of the planner's core plan element determinations and calculations (e.g., rate target). It also provides for streamlining with CAFO CWA NPDES Program plans (to the extent a certified farm also meets the definition of CAFO under the CWA, and sets forth a general goal that plan length be minimized to the greatest extent feasible.

Section 82.406 Planner Certification and Duties. This section sets forth training, education, and testing requirements that prospective planners must satisfy in order to be certified, along with continuing education requirements to maintain certification. Several aspects of these certification requirements are worth detailing further:

- Subsection (a) makes clear that nothing precludes a commercial famers from themselves obtaining certification and self-preparing their own plans.

- Subsection (c)(3) establishes conflict of interest limits for planners, focused on the synthetic fertilizer industry.

- Subsection (d) sets forth reporting and record-keeping obligations that planners must satisfy, including submission of annual activity reports.

Section 82.407 Training Programs and Continuing Education. This section sets forth the accreditation standards for certified nitrogen management training programs, including requirements for course content and testing. In structure, these requirements draw from the certification and accreditation programs implemented by EPA in the context of motor vehicle air condition servicing. In this context, it is anticipated that colleges and universities will seek accreditation.

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