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Greg Mayeur, Ph.D.
California Air Resources Board
1001 I Street
Sacramento, California 95814

Dear Dr. Mayeur:

Thank you for the opportunity to comment on the draft Rice Cultivation Projects Compliance Offset Protocol. We appreciate the openness with which you have asked for input and with which you have answered our questions throughout the protocol development process. We look forward to discussing many of the details of the DNDC model and the protocol through the on-going Technical Working Group (TWG) process in 2015. A number of the questions and concerns we have raised over the past year are still relevant to the current draft of the protocol, and it is our hope that through the formal comment process, as well as through the TWG process, these can be answered or addressed. Our comments on the draft protocol are organized thematically in six sections below.

A common theme among all of the sections is that much of the data, as well as the DNDC user interface, that are needed for members of the TWG and the public to review the protocol have not yet been made available for review. We trust (and request) that CARB make these data available for review during the process of further developing the protocol, well before the release of the protocol for 15-day comments just prior to being brought to the Board for possible adoption. We emphasize that due to the technical nature of the concerns and questions we raise, a 15-day comment period will be inadequate to provide the detailed feedback we hope to provide. In the process of protocol development, it will be important for members of the TWG and the public to have a chance to review the following well before a final version of the protocol is released: (1) the model run data used to validate the DNDC model, (2) the full set of values of all parameters used in the model that are not chosen by the user, (3) the numerical basis on which each of the project types are deemed additional, (4) a more detailed discussion of methods for validating field-specific baseline and project inputs into the DNDC model, and (5) the DNDC model interface itself. We look forward to discussing these important elements of the protocol in the context of the TWG, and to reviewing them once they are made available for review.

1. DNDC model, bias assessments, and a request for publically available data

It is our understanding that assessments of DNDC model bias (i.e., a significant trend in the residuals between modeled and measured values) have been made by rice-growing region and by project-type. We have inferred this because in the Staff Report accompanying the release of the draft protocol, Alternate Wetting and Drying (AWD) projects are not eligible in the

California Rice Growing Region because the model is said to "not have been validated" for this project type in this region. But we're not certain of this, since the data from the model runs used to validate the model have not been made publically available.

We first emphasize that model bias should be assessed for each project type. Lack of model bias for a set of fields representing current practice does not necessarily demonstrate lack of model bias for fields cultivated using the set of new practices being crediting under the protocol. As one example, the DNDC model may not capture the actual effects on emissions induced by the Alternate Wetting and Drying (AWD) practice, even if it models emissions from fields not using this practice without bias. Either project types should be proportionally represented in the data used for model validation, or model bias should be evaluated for each project type individually. Alternatively, CARB staff could provide a description of why the DNDC model used to validate emissions from fields cultivated under current practices will also estimate emissions (without bias) from fields being cultivated under new practices being credited under the protocol.

Second, in order to facilitate the process of public comment and input on the methods used to estimate emissions reductions by the protocol, it is essential that the details of the DNDC model validation and bias assessments be made publicly available. Publicly available data should include all parameter values (whether default, measured, or taken from a database) that were used for each model run used to validate the model. We have been requesting these data, which are necessary for the public to review CARB's validation of the DNDC model, for over a year now.

At the last TWG meeting, there was discussion about the development of a version of the DNDC software that would be built by CARB specifically for use with the protocol. The current draft of the protocol makes reference to this version of the model software and user interface (Version 9.5, September 2014) as available in the online resources for the Rice Cultivation Projects Compliance Offset Protocol. We understand that this version has not yet been made publically available. *We request that sufficient time be given to the Technical Working Group and interested stakeholders to review this new version of the model when it is available and prior to adoption of the protocol*.

As a part of this release, we request that the Technical Working Group and the public be invited to review the default parameter settings used by the model which are not editable by the user. For instance, while a default of 400 ppm atmospheric concentration is mentioned in the protocol, the yearly rate of increase in this parameter has not been included. Users are given the option of using default value for background NH3 concentration in the atmosphere, but it is unclear what the default value is. Table 6.1, which outlines whether OPO-defined or DNDC default parameters should be used in running the model does not specify what the numeric values are for most of the parameters for which users will use a default value. Presumably a decision must be made about which value to use for each parameter. These parameter settings can meaningfully influence the modeled results and must be made available for public review and discussion within the TWG in an effort to ensure the accuracy of estimated emissions reductions under the protocol.

2. Treatment of nitrous oxide (N_2O) emissions and the threshold-approach to moisture content for Alternate Wetting and Drying (AWD) projects

We appreciate the conservative choice to not credit N_2O emissions reductions, and only to debit N_2O emissions increases.[i] This provision is essential given the scientific uncertainty of the environmental factors that drive N_2O fluxes from rice fields, resulting in DNDC's inability to accurately capture spikes in N_2O emissions, which occur as rice fields dry. Emissions from spikes following single drainage events can account for 40-60% of annual N_2O emissions from rice fields (Pittelkow et al. 2013), and adding multiple drainage events in an AWD cycle could compound the problem.

We raise a continued concern, however, with the inclusion of the N_2O term in the protocol: if the DNDC model fails to capture spikes generated by drying out fields, the model's reported average project reporting period N_2O emissions ($N_2O_{P,i}$) may be a significant underestimate for some fields.[ii]

We understand that the limit that soil moisture must remain above 50% threshold in fields employing the AWD project type is included to reduce the potential for large N_2O fluxes from these fields. We urge CARB Staff to make publically available their basis for determining that 50% soil moisture would prevent such over-crediting and its assessment of the state of scientific knowledge of the environmental drivers of N_2O spikes from drying fields.

Finally, we raise a logistical question about the operation of the protocol. For AWD projects, the draft protocol indicates that if a single reading of soil moisture in a field is either below 50% or is still saturated after drying, then that "area of the rice field" is not eligible for crediting for that cultivation year.[iii] How is the corresponding "area" of the field determined? This should be clarified in the protocol text.

3. Incentives created by the protocol not to switch to shorter season rice varieties

The current draft of the protocol includes the eligibility requirement:

> Offset projects developed using this protocol must:…Grow rice of the same maturity characteristics during the crediting period as the baseline period.[iv]

This requirement could create a disincentive for farmers to switch to shorter duration rice. Shorter duration rice would use less water, and may result in less methane emissions on average because of a shorter flooding season. It is possible that there could be a business-as-usual shift toward shorter duration rice varieties in both California and the Mid-South, in part, due to the lower water requirements of such varieties. Because of the water use benefits, and possible

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[i] This conservative choice is reflected in the primary emissions reductions (PER_i) portion of Equations 5.4.1 and 5.4.2 in the draft Protocol in the term $MIN[N_2O_{B,i,j\text{-}CO2e} - N_2O_{P,i,j\text{-}CO2e}), 0]$.

[ii] In terms of the equations used, while the term $MIN[N_2O_{B,i,j\text{-}CO2e} - N_2O_{P,i,j\text{-}CO2e}), 0]$ would likely still result in a value < 0, the absolute value of this debit from PER_i might be small relative to the true value of $(N_2O_{B,I} - N_2O_P)$, resulting in meaningful over-crediting of PER.

[iii] Section 2.3(c).2, on p. 9 of the draft protocol.

[iv] Section 3.1(a).2 on p. 11 of the draft protocol.

emissions benefits, we believe that it is important that the protocol avoid creating a disincentive to switch to shorter duration rice.

Because actual farmer practice in the Mid-South during baseline years is not used to determine the baseline, but rather the DD50 model is used, we understand that there should be no reason to require the above restriction in the Mid-South. Instead the rice variety used in the project years would be put into the DD50 model for both baseline and project years.

Even if the profits that could be generated from offsets are considered insufficient to create this disincentive at today's offset prices, at higher offset prices this disincentive could become more significant. We recommend that CARB consider a way to allow farmers to shift to shorter variation rice without losing the ability to participate in the offset protocol in both California and the Mid-South. This modification could either be included in the first adopted version of the protocol, or could be adopted as a change later, if offset prices were to increase substantially or if there is evidence of this disincentive affecting farmer choice of rice variety.

4. Performance standard test and a request for data availability

We recommend changes to the way that additionality is discussed in the staff report accompanying the protocol, and request that the data used to make the additionality assessment be made publicly available for each of the project types.

The staff report describes the performance standard approach to additionality assessment as follows: "A performance standard establishes a threshold for greenhouse gas emissions that is significantly better than average, business-as-usual greenhouse gas (GHG) emissions for a specified activity. If a project developer meets or exceeds the standard, the project satisfies the criterion of "additionality." If the project meets the threshold, then it exceeds what would happen under the business-as-usual scenario and generates additional GHG reductions." (Staff Report, p. 12)

The second two sentences in this description of the performance standard approach are problematic. CARB staff has chosen to use a performance standard to assess the additionality of its offset protocols. The last two sentences of the above quotation from the staff report, instead of discussing the performance standard as tool for assessing additionality, is attempting to redefine additionality as the test itself.

Additionality is a commonly used term with regard to carbon offsets, which grows out of the fundamental idea of offsetting. Offsetting allows an emitter to choose to pay someone else to reduce emissions instead of reducing their own emissions. Whether the emitter reduces their own emissions or causes someone else to reduce emissions, the obligation to reduce emissions still must be met. "Additionality" is a requirement of any offset program, and simply means that an emitter can only offset their emissions if they *cause* emissions to be reduced elsewhere. If an emitter simply pays someone to do what they were doing anyway, the emitter is buying their way out of reducing emissions, rather than meeting an obligation to reduce emissions. This idea is captured well in the language of AB 32, which states that a requirement of any market based compliance mechanism is that: "the reduction is in addition to any greenhouse gas emission

reduction otherwise required by law or regulation, and any other greenhouse gas emission reduction that otherwise would occur" (Cal. Health & Safety Code §38562(d)(2)). Put in other words, does it make sense for California's global warming law to result in fewer emissions reductions because some rice farmers are already draining their fields early and because some surface coal mines are already capturing their methane for pipeline sales?

Turning back to those two sentences, if a "project developer meets or exceeds the standard" defined by CARB, this does not necessarily mean that the incentive created by the offset program caused the project developer to do this. If a "project meets the threshold" defined by CARB, this does not necessarily mean that emissions are lower than they would have been without the offset program. Meeting a performance test does not necessarily mean that the reductions are additional.

An example may help describe why this is so, and why a simple performance test is useful, but insufficient on its own, to ensure the additionality of the credits generated by a protocol. Even though the numbers of rice growers currently practicing each of the project types included in the protocol are understood to be small, the non-additional emissions reductions from such projects could constitute a significant fraction of total reductions credited under the protocol. First, let's assume, as was stated at the March 17, 2014 Workshop, that roughly 1-2% of rice fields are currently engaging in early drainage. If over the next 10 years, with the financial support of the protocol, an average of 4% of fields were to drain early, then, assuming each field generates roughly equal amounts of emissions reductions, up to approximately one half of the generated credits could be from non-additional practice – fields that were engaging the practice regardless of the offset protocol. If an average of 8% of fields were to early drain over the next ten years, then up to approximately one quarter of credits generated could be non-additional during that period. If the Board expects around 8% of fields to engage in this practice after the protocol is adopted, then we would expect, *a priori*, 25% of credits to be from non-additional projects. This is assuming that the 1-2% of fields currently engaging in early drainage will continue to do so even without the generation of offset credits.

One more step, beyond a simple performance test, is needed to evaluate whether the protocol meets the additionality criterion. The environmental integrity of a protocol is upheld if the total number of credits generated by the protocol does not exceed the actual effect of the protocol on emissions. That is, the total number credits generated should not exceed the total reductions from truly additional projects. The application of an uncertainty discount factor provides some buffer within the Rice Cultivation protocol. Net over-crediting would likely be avoided if the under-crediting that is likely to occur because of the application of the uncertainty discount factor counterbalances the amount of over-crediting expected from non-additional projects that will inevitably be credited under the protocol. Such analyses will never be black and white. However, we believe that a performance based approach to additionality testing needs to go beyond a simple "significantly better than average" assessment. Specifically, the test should also include a reasonableness test that broadly assesses whether the protocol is likely to avoid over-crediting its effect on emissions under reasonable assumptions. In addition, ex-post assessments should point to the same general conclusion that the effect of the protocol on new projects is apparent in project trends, and that the total number of credits generated by the protocol were not greater than the estimated effect of the protocol on new activities.

We offer two recommendations. *First, we recommend that the last two sentences in the paragraph from the staff report quoted above be deleted so that the statement expresses that the performance standard is used practically to assess additionality, without contradicting the well-established meaning of "additionality." Second, we recommend that when CARB applies the performance standard approach, it includes a reasonableness test that broadly assesses whether the protocol is likely to avoid over-crediting its effect on emissions under best-guess assumptions about non-additional crediting, additional reductions expected to result from the incentives created by the protocol, and the under-crediting that is likely to result from conservative emissions reduction estimate methods.*

5. Verification of tail water from early drainage

We appreciate the decision to exclude eligibility for projects whose tail water flows directly into a natural wetland that has no standing water, because of the risk that emissions from early drainage would simply be transferred from rice field to dry wetland.[v] How will such an assessment actually be made hydrologically? How does a project verifier verify that tail waters flow into a dry wetland without being there when the wetland is dried? Are photographs or other mechanisms to be used to make this assertion?

6. Verification of input parameters

Since methods for verifying baseline and project inputs have not yet been included in any detail in the protocol draft or accompanying staff report, and are an important but challenging element of protocol effectiveness, we request that methods for verifying the various model inputs be discussed in the TWG with adequate time for consideration and discussion before the protocol is brought to the Board for adoption.

We look forward to continuing to participate in this process.

Sincerely,

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[v] Section 2.2(d), on p. 9 of the draft protocol.