Nitrogen Management Project Protocol (NMPP)

CLIMATE ACTION RESERVE

Public Workshop

May 9, 2012

9:00 AM – 12:00 PM PDT

Sacramento, CA

Welcome and Introductions

Agenda

- Introduction to the Climate Action Reserve
- Protocol Development Process and Timeline
- Overview of the Nitrogen Management Project Protocol
- Next steps
- Question & Answer

What is the Climate Action Reserve?

- Non-profit GHG offsets registry
- Develop high-quality project standards, oversee verification, and register/track offset credits in public online system
- Ensure environmental integrity and quality of offset credits

- Reserve stats:
  - 374 account holders
  - 474 projects total with 232 projects listed
  - 139 projects registered with 24.5 million CRTs issued
  - Projects in 45 states

Principles of Reserve Project Accounting

CLIMATE ACTION RESERVE

- **Real:** Reductions have actually occurred, and are quantified using complete, accurate, transparent, and conservative methodologies
- **Additional:** Reductions result from activities that would not happen in the absence of a GHG market
- **Permanent:** Reductions verified ex-post, risk of reversals mitigated
- **Verified:** Emission reports must be free of material misstatements, confirmed by an accredited verification body
- **Owned unambiguously:** Ownership of GHG reductions must be clear
- **Not harmful:** Negative externalities must be avoided
- **Practicality:** Project implementation barriers should be minimized

The Standardized Approach

CLIMATE ACTION RESERVE

Benefits to a top-down approach:

- Low up-front costs to project developers
- Efficient review and approval of projects
- Transparency and consistency
- Same approach applies across projects
- Prescriptive guidance to eliminate judgment calls

But...high initial resource investment to program

Protocol Development Goals

- Develop a standardized approach for quantifying, monitoring and verifying GHG offsets from improvements in nitrogen management practices for crop production in the U.S.
  - Modular protocol: scope initially limited, but designed to expand to include additional project activities, regions, and crops
- Build on existing methodologies
  - MSU-EPRI Protocol: *Quantifying N_2O Emissions Reductions in US Agricultural Crops through N Fertilizer Rate Reduction* (in 2nd Assessment Phase w/ VCS; completed public comment phase w/ ACR)
  - ACR Protocol: *Methodology for N_2O Emissions Reductions through Changes in Fertilizer Management* (adopted by ACR)
  - Government of Alberta's NERP Protocol: *Nitrous Oxide Emission Reduction Protocol from Farm Operations* (adopted and in use in Alberta
- Balance accuracy and practicality of projects

Protocol Development Process

- Internal protocol scoping and public scoping meetings (Fall 2010)
- Form multi-stakeholder workgroup (Spring 2011)
- Draft protocol with assistance from technical consultant (Summer 2011 – Spring 2012)
- Send draft through workgroup process (Aug 2011 / April 2012)
  - Workgroup provides technical expertise and practitioner experience
  - Periodic meetings and individual consultation when needed
- Revise draft based on workgroup comments (April 2012)
- Public draft protocol released for public review (April 24 – May 23, 2012)
- Public comments incorporated (May/June 2012)
- Protocol submitted to Reserve Board for adoption (June 27, 2012)

Workgroup

Blue Source
Camco
The Clark Group, LLC / Agricultural Carbon Market Working Group
Environmental Defense Fund
Environmental Services, Inc.
Independent Scientist, Ecosystem Modeling
Michigan State University
Natural Resources Defense Council
Preferred Carbon Group
Scotia Capital, Inc.
Stanford Law School
U.S. Department of Agriculture, Natural Resources Conservation Service
U.S. Environmental Protection Agency
Union of Concerned Scientists
University of California, Davis
Western Growers Association
Western United Dairymen
Wildlife Works Carbon

- Technical Consultant: Terra Global Capital
- Science Advisory Committee convened
  - First time Reserve has convened an SAC to inform protocol development
- Also advised by multi-stakeholder subcommittees (both workgroup and non-workgroup members)

Science Advisory Committee Process

- To help the Reserve interpret and apply the best available science into the NMPP
- Group of leading scientific experts on N_2O emissions from agricultural management practices
  - Jointly convened by CAR and Nicholas Institute at Duke
- Evaluated and provided recommendations on nitrogen management practices likely to result in N_2O emission reductions, considering criteria such as:
  - Number of studies with field N_2O measurements
  - Whether studies showed consistent results
  - Whether N_2O emissions reductions were direct or indirect and primary or secondary
- Consulted throughout protocol development process

Scope of NMPP Version 1.0

Potential Nitrogen Management Practice **(e.g. priority practices, as recommended by SAC)**	**Included in Version 1.0 NMPP?**	**National data available to develop performance standard?**	**A standardized quantification methodology for N_2O emissions available that meets Reserve criteria?**
Reduce N applied	Yes	Yes	Yes – MSU-EPRI
Use of nitrification and urease inhibitors	No	Yes*	No
Use of nitrification inhibitors (only)	No	Yes*	No
Switch from fall to spring application	No	Yes*	No
Switch from anhydrous to urea	No	No	No
Change to slow release fertilizer	No	No	No
Change to fertigation	No	No	No
Apply N closer to roots	No	No	No
Add N scavenging cover crops	No	No	No

Scope of NMPP Version 1.0

- SAC-identified project activities were only included in the protocol if the activities had both:
  - Sufficient data to develop a performance standard
  - *And* a quantification methodology meeting Reserve criteria

- Only “Reduce N applied” met all criteria

Plan for Ongoing NMPP Scope Expansion

- Appendix A – Summary of performance standard research, including preliminary research on other practices & regions
- Appendix D – Summary of Reserve guidelines on minimal data requirements and procedures that field studies shall meet to be considered for developing a quantification methodology
  - Ongoing work during public comment period to further clarify data requirements for empirical vs. process models
- Expansion of protocol will be Reserve-directed
- Version 2.0 priorities include:
  - California cropping systems (reduce N applied & other practices)
  - Expanding geographic & crop coverage for Reduce N applied

Overview of the NMPP

Project Protocol Components

Define the GHG reduction project	Section 2
Determine eligibility	Section 3
Establish the GHG Assessment Boundary	Section 4
Calculate GHG reductions – Primary effect emissions – Secondary effect emissions	Section 5
Monitoring requirements	Section 6
Reporting requirements	Section 7
Verification guidance	Section 8

Project Definition & Approved Project Activities (Section 2)

- Project definition: "the adoption and maintenance of an approved project activity that reduces N_2O emissions"
- Approved project activities listed in Table 2.2

Approved Project Activities	Description	Applicable Crop(s)	Applicable Region(s)
Reduce N Applied	Reduction in the annual nitrogen application rate compared to recent historic application rates at the site, without going below N demand	Corn	North Central Region

Defining Field Boundaries (2.2.1)

- Project activities implemented on individual fields
- Fields are defined with specific boundaries for protocol & project definition purposes:
  - Direct management control of a single entity
  - Contiguous
  - Homogenous management practices (e.g. same crop grown throughout field; N fertilization occurs for entire field within same week; N rate, composition, placement and cover crops consistent across field)
- If a field doesn't meet these criteria, field not automatically ineligible; the project participant will need to define his/her field into smaller units

Defining the Cultivation Cycle (2.2.2)

- Cultivation cycle defined as:

"the period starting immediately after harvest of one primary crop and ending after the next primary planted crop is harvested the following calendar year"

- For Version 1.0 (corn only), further defined as 365 days

Project Aggregates (Section 2.3)

- Fields are not required to participate in an aggregate but strongly encouraged to do so to ease verification costs and minimize the uncertainty deduction
  - No upper limit on number of fields
  - There is an upper limit on the *size* of a field in relation to the total acreage of the aggregate
  - Rules for entering and leaving (Section 2.4.2)
    - Rules minimize ability of one field to change aggregates mid-crediting period
    - Provide requirements that must be met for a field to continue in program if land ownership or tenant occupancy changes

Aggregators and Project Participants

- Aggregator
  - A corporation or other legally constituted entity, city, county, state agency, or individual
  - Must have an account on the Reserve (replaces Project Developer Account)
  - Official agents to the Reserve on behalf of participants in a project aggregate
  - Ultimately responsible for submitting all required forms and complying with the terms of the NMPP
  - ***Growers can serve as their own aggregator or as the aggregator for a group of fields***

- Project Participants
  - Agricultural producers who elect to enroll fields in a project aggregate
  - May own or lease the project fields
  - Must be responsible for management decisions for crop production on their fields enrolled in the project
  - Are **not** required to hold an account on the Reserve

Issuing CRTs to the Aggregate

- CRTs issued by the Reserve to the aggregator
- The aggregator must attest to the Reserve that they have exclusive claim to the GHG reductions resulting from all fields in the project aggregate
- Protocol does not dictate the terms for how title will be established
  - Allows the aggregator, project participant and land owner (if separate from the project participant) maximum flexibility for the terms of contracts between the respective parties
- Aggregator must also inform land owner with a “Letter of Notification of the Intent to Implement a GHG Mitigation Project”
- Verifier will review contracts and notification letters as component of verification

Section 3 – Eligibility Rules

Eligibility Rule I:	Location & Crop System	→	*U.S. and U.S. Tribal (long term)* *Corn in North Central Region (Version 1.0)*
Eligibility Rule II:	Project Start Date	→	*No more than six months prior to project submission*
Eligibility Rule III:	Additionality	→	*Meet performance standard*
		→	*Exceed regulatory requirements*
Eligibility Rule IV:	Regulatory Compliance	→	*Compliance with all applicable laws*
Crediting Period	5 eligible crop years from start date, renewable one time (10 eligible crop years total)		

Location and Crop System (Section 3.1)

- Fields must be located in regions and employ crop systems for which an applicable quantification approach is available
  - Currently limited to corn in North Central Region

    (Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Missouri, Nebraska, North Dakota, Ohio, South Dakota, Wisconsin)
  - Future versions shall include other U.S. regions and crops, with a priority to include California

Start Date (Section 3.2)

- Each field has a unique start date, defined as the first day of the new cultivation cycle during which one or more of the approved project activities is adopted

- However, fields that are part of an Aggregate will be subject to the Aggregate's uniform reporting start date (which may differ from the field's start date).

- Fields with start dates back to June 27, 2010 are eligible if submitted within the first year following protocol adoption (i.e., by June 27, 2013)

Crediting Period (Section 3.3)

- Crediting period applies to field, not aggregate
- Defined as 5 eligible crop years, over a period of up to 10 years, renewable one time
  - Eligible crop year = a year in which an eligible crop (corn) is grown on the field
  - In an eligible crop year, if a field does not meet the performance standard or is withdrawn from verification activities for some other reason, that eligible crop year counts as one of the field's 5 eligible crop years for that crediting period
- Reporting must be continuous throughout crediting period (including ineligible crop years for multi-crop rotations)
  - N loading (e.g. increases in N rate) for ineligible crop years not allowed (affects eligibility in subsequent years)
  - Reporting requirements for ineligible years are minimal

Other Eligibility Criteria (Section 3.4)

- Management records
  - Past 5 years of historic data required (monoculture), or at least 3 eligible crop years (multi-crop rotation).
  - Striving for flexibility, particularly with multi-crop rotations
- "Consistent" crop production system
  - Crops planted during the project must be "consistent" with past management (based on records), particularly the frequency and sequencing of eligible crops
  - Aim is maximum flexibility for non-eligible crops without being overly prescriptive
- Yield effects
  - Increases/decreases in yields compared to pre-project yields are allowable, but potential "leakage" due to yield reduction must be quantified

Standardized Additionality (Section 3.5)

- Projects must satisfy the following tests to be considered additional

  - **The Performance Standard Test**: By meeting the performance threshold for a specific management activity, a field demonstrates that nitrogen management associated with the project activity exceeds the regional common practice standard for N_2O emissions management

  - **The Legal Requirement Test**: Ensures project activities are not a result of legal obligations

Performance Standard Research & Development (Appendix A)

- Performance Standard is based on a Nitrogen Use Efficiency metric applied at the field level
- Decision to set Performance Standard is based on
  1. Research into how farmers make fertilizer decisions
  2. Research into how representative N fertilizer rate recommendations (from different entities) are of actual common practice
  3. Understanding of nitrogen cycling in cropping systems
- Research into setting a Performance Standard also helped the Reserve determine how to set the project field's baseline under this protocol

Performance Standard Research & Development (Appendix A)

CLIMATE ACTION RESERVE

1. How do farmers set nitrogen fertilizer rate?

Application Used	2001	2005
	Percent of Farmers	
Soil or tissue test	18.8	27.0*
Crop consultant recommendation	13	17.6*
Fertilizer dealer recommendation	28.7	41.2*
Extension service recommendation	3.2	4.6*
Cost of nitrogen and/or expected commodity price	11.4	17.3*
Routine practice	70.9	71.7*
	Number	
Observations	1,646	1,344

(Ribaudo et al. 2011)

- Over 70% of farmers base their N rate decision on **routine practice**
- Historic or routine practice N rate is the best predictor for future N rate decisions and practices

Performance Standard Research & Development (Appendix A)

CLIMATE ACTION RESERVE

2. State-average and recommended N fertilizer rates (MRTN or yield goal) are not necessarily consistent predictors of actual practice
   - Fields that receive an equal amount of N fertilizer can vary drastically in terms of yield, how much N is lost, etc.
   - Comparisons between MRTN recommended N rates and actual N rates suggest that the average farmer in leading corn-producing states does not commonly apply more N than the recommended N rate
   - Recommended N rates are designed to maximize yield or profit, but are not specifically optimized to minimize harmful N losses
3. Effects of N management regime on a field's N balance are greatly impacted by its soil type and other environmental variables

In conclusion, a field-specific metric based on nutrient use efficiency (NUE) was considered most appropriate for the performance standard

Performance Standard (3.5.1)

CLIMATE ACTION RESERVE

- Ideally, when characterizing a field's specific NUE, all N inputs, losses, and internal recycling should be considered
- In practice, available data from USDA ARMS is limited to:
  - Fertilizer N inputs (Synthetic and Organic)
  - Crop yield and N content
- Therefore, performance standard based on the **Ratio of N Removed-To-Applied Nitrogen (RTA)**

$$\mathbf{RTA} = \frac{\boldsymbol{Crop\ Yield \times Crop\ N\ content}}{\boldsymbol{Annual\ N\ Application\ Rate}}$$

- RTA is robust, straightforward, transparent, and is calculated using readily available data

Performance Standard (3.5.1)

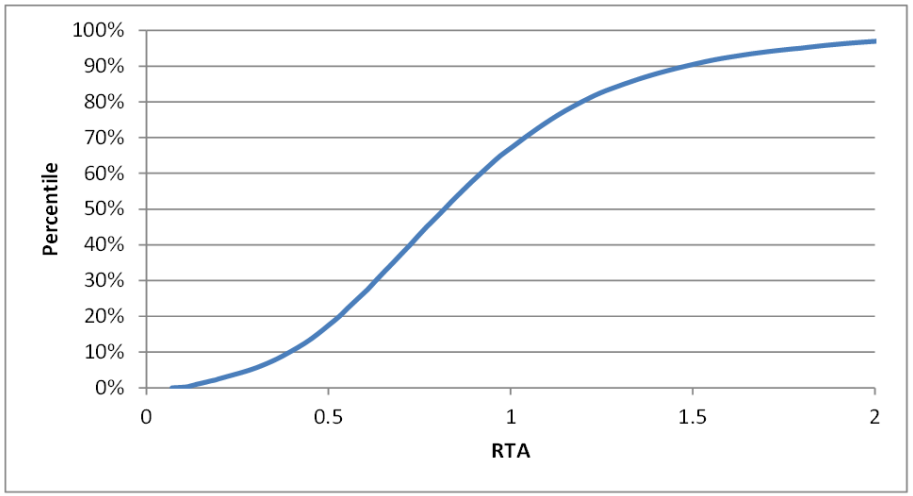
- The performance standard is applied at the field-level, and each field must pass the performance standard every reporting period (RP) to be eligible for crediting during that RP

- A field implementing the project activity "reduce N application" passes the performance standard when the field's RTA meets or exceeds the state- and crop-specific RTA threshold (Table A.8).

- The calculation to demonstrate that a field passes the performance standard occurs ex-post (e.g. after completion of the RP)
  - Project developers are encouraged to use a field's historic yields and the target RTA threshold for that field to estimate the N-rate necessary for a given field to pass the Performance Standard Test.

Setting the Performance Standard Thresholds (Appendix A)

- USDA ARMS Dataset provided state average N-rates and yields for various crops, which were used to calculate the average RTA for each state
  - No appropriate distribution data are publicly available from USDA
- Confidential stakeholder data provided on "typical distribution" of N-rates and RTA values was used to approximate state RTA distributions from average RTAs



Percentile	RTA
10%	0.39
20%	0.53
25%	0.58
30%	0.63
40%	0.72
50%	0.82
60%	0.92
70%	1.04
75%	1.11
80%	1.20
90%	1.48

Example Distribution of the RTA for corn fields in Michigan (left) and RTA Values for Different Percentile Levels (right)

Setting the Performance Standard Thresholds (Appendix A)

- RTA performance standard thresholds are set at the 75th percentile (approximated)

- Though states' historic RTA trends were considered, the Reserve determined to set all states' performance thresholds at the 75th percentile.

- States with improving RTA or N-rate trends are given special consideration in default baseline calculations.

Setting the Performance Standard Thresholds

CLIMATE ACTION RESERVE

Table A-8 (partial): State RTA Performance Thresholds & Default Baseline RTAs

State	Crop	Previous Crop	RTA Performance Threshold	Default RTA (to calculate baseline)
Illinois	corn grain	corn	0.93	0.68
		soybean	0.96	0.7
	corn silage	corn	0.95	0.69
		soybean	0.97	0.71
Indiana	corn grain	corn	1.02	0.75
		soybean	1.03	0.76
	corn silage	corn	1.18	0.87
		soybean	1.23	0.9
Iowa	corn grain	corn	1.04	0.76
		soybean	1.11	0.82
	corn silage	corn	1.2	0.88
		soybean	1.28	0.94

Modified Performance Standard during a Field's Grace Period

- Grace period is allowed for the first two eligible crop years of a field's first crediting period
- During a field's grace period, RTA performance needs to progress towards the 75th percentile RTA threshold
- By the third eligible crop year, the field RTA must meet or exceed the 75th percentile

Legal Requirement Test (Section 3.5.2)

- A project passes the Legal Requirement Test (LRT) when there are no laws, statutes, regulations, etc. that require the project activity
  - Project Aggregator must sign an Attestation of Voluntary Implementation
- Reserve has found no federal, state or local laws that explicitly require the project activity
  - However, the Reserve believes water quality regulations, particularly pertaining to nonpoint source runoff, are the likeliest regulations to impact this protocol
- If the project activity becomes legally required for a given field during the crediting period, CRTs may be reported up until the effective date of the regulation
  - The LRT is applied at the field level (not aggregate level)

Legal Requirement Test (Section 3.5.2)

"Fields that are located in impaired watersheds with established TMDLs for Nitrogen that identify agriculture as a source of impairment shall not pass the Legal Requirement Test unless the field (and/or appropriate non-point source under which discharges from the field would be categorized) has specifically been identified as not contributing to the watershed's impairment."

- "Impaired watersheds" are those identified to be out of compliance with the Clean Water Act (e.g. not meeting water quality standards)
- Reserve found no federal or state laws explicitly requiring the approved project activity
- Notably, progressive CA water quality regulations may effect eligibility for future CA modules (e.g. Central Coast RWB Ag Waiver, March 15, 2012)

Credit & Payment Stacking (Section 3.5.3)

- Credit stacking is not specifically addressed in Version 1.0 because no water quality trading programs (WQTPs) in the NCR have issued nutrient reduction credits for the approved project activity
- Payment stacking is allowed, in certain circumstances:
  - Farmer may not have a signed agreement for CPS 590 prior to submitting the field to the Reserve (e.g. NRCS, EQIP funding must be pursued simultaneous to project start)
- Fields stacking CPS 590 payments are only eligible to receive CRTs for the portion of the project not funded by public dollars
  - For example, if a farmer receives a payment for 50% of the cost of practice implementation, the number of CRTs issued is to be reduced by 50%

Regulatory Compliance (Section 3.6)

- Project must be in compliance with all federal, state, and local laws and mandates
- Includes air, water quality, water discharge, safety, labor, endangered species protection
- If any violations do occur, project must disclose in writing to verifier any and all instances of non-compliance
  - Verifier's judgment determines whether violation was related to the project or not

GHG Assessment Boundary (Section 4)

- Defines Source Sinks and Reservoirs (SSRs) that must be assessed to accurately quantify GHG reductions for the approved project activity
  - Primary Effect Sources
    - SSR 1 – Emissions from 'Soil Dynamics.' (Only N2O included; Quantified with empirical model adapted from MSU-EPRI)
    - SSR 2 – Emissions from Leaching, volatilization & runoff (Included; IPCC approach)
  - Secondary Effect Sources
    (Secondary sources only included when the emissions increase)
    - SSR 3 – Cultivation Equipment (Included if increase in emissions)
    - SSR 4 – Emissions from Irrigation (Excluded)
    - SSR 5 – Emissions from Off-Site Storage of Manure (Included if storage increased)
    - SSR 6 – Emissions from Fertilizer Transportation (Included)
    - SSR 7 – Emissions from Shifted Production Outside Project Boundary (Leakage)
    - SSR 8 – Emissions from Synthetic Fertilizer Production (Excluded)
    - SSR 9 – Emissions from Production and Use of Chemical Inputs (Excluded)

Quantifying GHG Reduction (Section 5)

$$ER = PER - SE$$

(All calculated at the aggregate level)

- PER: Primary Effect Emission Reductions
  - N_2O emissions from soils (SSR 1)
  - N_2O emissions from leaching, volatilization & runoff (LVRO; SSR2)
- Corrected for uncertainty

- SE: Secondary Emissions
  - Additional use of cultivation equipment (SSR 3)
  - Increase in off-site manure storage (SSR 5)
  - Increase in fertilizer transportation emissions (SSR 6)
  - Production Shifting (Leakage) (SSR 7)

Applicability Conditions (Section 5.1)

- The project area shall not contain organic soils (e.g. histosols)
- All types of N fertilizer are eligible and must be accounted for
  - Synthetic (e.g. granular urea, ammonium nitrate, UAN) and organic (e.g. manure, compost, digester effluent/solids)
- Accurately determining N-content is critically important
  - Fertilizer N-content labels will be used primarily (for synthetics and processed organics); where labels are unavailable, use farmer records, lab tests, or default N-contents
- Total organic N may increase (at field, aggregate level), but synthetic N may not increase on any field. Total N must decrease to implement a project

Determining the Baseline (Section 5.2)

- **Step 1:** Determine the historical look-back period and collect historical yield and N-rate data.
  - All eligible crop years in last 5 years, extended until at least 3 eligible years are included
- **Step 2:** Calculate the historical average RTA
  - Calculate annual RTA for each of historical baseline years
  - Calculate the average historical RTA
- **Step 3:** Determine baseline N-rate
  - Determine whether historic N-rate or default N-rate shall be used, by comparing field's historic average RTA to the default RTA (Table A.8)
  - If field's RTA is greater than default RTA, field's historic N-rate shall be used
  - If field's RTA is less than default RTA, must calculate the default baseline N-rate from the default RTA, using the field's actual yields

Additional Background on the Default Baseline

- For those fields well below “common practice” in their state, a field-specific default baseline, instead of field-specific historic baseline, shall be used.
- For most states, “common practice” is defined as the 50th Percentile RTA
  - Specifically, 50th percentile is used for states with no trend, increasing N-rate trend, or decreasing RTA trend
- For states where RTAs and/or N-rates shows an improving trend, common practice is defined as the 60th Percentile RTA
  - Specifically, 60th Percentile used for states with decreasing N-rate trend or increasing RTA trend

Quantifying Primary Effect Emissions (5.4)

N_2O Emissions from Soil Dynamics (SSR 1)

$$N_2O_{Dir,X,f} = \left(NR_{X,S,f} + NR_{X,O,f} \times 0.8\right) \times EF_{Dir,X,f} \times \frac{44}{28} \times \frac{310}{1000}$$

$$EF_{Dir,X,f} = \frac{0.67 \times \left(e^{\left(0.0067 \times \left(NR_{X,S,f} + NR_{X,O,f}\right)\right)} - 1\right)}{\left(NR_{X,S,f} + NR_{X,O,f}\right)}$$

X	=	Baseline or Project
$EF_{Dir,X,f}$	=	MSU-EPRI Tier 2 emission factor
$NR_{X,S,f}$ & $NR_{X,O,f}$	=	Synthetic, Organic fertilizer N on field *f*, respectively.

(Equation in draft is incorrect, correct equation is shown)

Quantifying Primary Effect Emissions (5.4)

N_2O emissions from leaching, volatilization & run-off (LVRO, SSR 2)

$$N_2O_{LVRO,B,f} = \left(\left(\left(NR_{B,S,f} \times 0.10 + NR_{B,O,f} \times 0.20\right) \times 0.01\right) + \left(NR_{B,f} \times Frac_{LEACH} \times 0.0075\right)\right) \times \frac{44}{28} \times 310 \div 1000$$

N_2O from Volatilization

- 0.10 and 0.20 are the IPCC default factors for the fraction of synthetic N and organic N that is volatilized, resp.
- 0.01 is the IPCC default emission factor for volatilized N.

N_2O from Leaching and Run-Off

- $Frac_{LEACH}$ and 0.0075 are the IPCC Default Factor for the fraction of total N that is lost through leaching or run-off and the emission factor for leached N, resp.

X	=	Baseline or Project
$NR_{X,S,f}$, $NR_{X,O,f}$ and $NR_{X,f}$	=	Synthetic, Organic and Total fertilizer N on field *f*
44/28 and 310/100	=	Factors to convert kg N2O-N to tCO_2e

Uncertainty Deductions (5.4.4)

- Uncertainty deductions cover both
  1. uncertainty of input data
  2. uncertainty inherent to the model (structural uncertainty)
- Ideally, structural uncertainty is estimated using independent data (known as “validating the model”)
- Uncertainty deductions in MSU protocol
  - Structural uncertainty is estimated as the uncertainty of the measurements used to develop the model
  - Uncertainty may be underestimated since no independent data were used to estimate structural uncertainty

Uncertainty Deductions (5.4.4)

- Uncertainty methodology in NMPP is adapted from in MSU-EPRI protocol, with 3 deviations
  1. 25% increase in uncertainty to account for not using independent data
     - This is a conservative approach; the 25% may be reduced once independent data become available
  2. Uncertainty decreases as the number of fields in aggregate increase
     - Aggregates with >5-6 fields will offset the 25% increase in uncertainty from not using independent data
  3. Uncertainty deduction is based on a continuous function, not a look-up table (more user-friendly)

Quantifying Secondary Impacts (Section 5.5)

- Must quantify *increased* CO_2 emissions from cultivation equipment (SSR 3)
  - E.g. If the project activity increases the number of field passes; OR changes seeding, irrigation or herbicide application
  - If organic fertilizer use increases: changes in equipment associated with spreading and incorporating organic fertilizer (esp. manure) are likely.

$$SE_{FF} = \sum_{f} \left(\frac{\sum_{j} (FF_{PR,j} \times EF_{FF,j})}{1000} \right)$$

(Equation adjusted from draft)

$FF_{PR,j}$ = increase in fossil fuel for field f during the reporting period, by fuel type j
$EF_{FF,j}$ = fuel specific emission factor

Quantifying Secondary Impacts (Section 5.5)

- If organic N applied decreases, must quantify increased N_2O and CH_4 from increase in off-site manure storage (SSR 5)
  - Because manure supply is inelastic, reduced manure N application can increase manure storage and associated GHG emissions (SE_{MS})
  - The change in manure application (DMA) is estimated as follows:

$$\Delta MA = \sum_f \left(A_f \times \left(NR_{P,O,f} - NR_{B,O,f} \right) \right)$$

A_f = Size of field *f*

$NR_{P,O,f}$, $NR_{B,O,f}$ = Project and baseline organic fertilizer N on field *f*

  - **If $\Delta MA < 0$:** $SE_{MS} = \Delta MA \times EF_{MS}$

EF_{MS} = Emission factor from manure storage, TBD (under development)

(Note that in case $\Delta MA > 0$, SE_{MS} is not accounted for.)

Quantifying Secondary Impacts (Section 5.5)

- Must quantify *increased* CO_2 from increase in fertilizer transportation emissions (SSR 6)
  - Only organic fertilizer N is allowed to increase. Therefore, only emissions from increased organic N transport (SE_{MT}) must be accounted for.
  - If $\Delta MA > 0$, SE_{MT} = calculated based on
    - the **distance** of manure transport in the project and the baseline
    - the **mass** of manure applied in the project and the baseline
    - transportation **emission factor**

  (If $\Delta MA < 0$, SE_{MT} is not accounted for.)

Quantifying Emissions from Production Shifting (Leakage) (Section 5.5.4)

- Approved project activities not expected to dramatically affect crop yields
  - If crop yields decrease as a direct result of project activity, a net increase in production elsewhere outside the project boundary is assumed
- Annual aggregate yield must be compared to historical yields from the same project area
  - Yields fluctuate annually depending on climatic and other drivers
  - Yields are normalized to average annual county yields using USDA NASS statistics
- Any decrease beyond the significance threshold must be accounted for by assuming increased emissions outside the project boundary (See Equation 5.23)

Project Monitoring (Section 6)

- Aggregate projects must develop one Aggregate Monitoring Plan (AMP) and Field Monitoring Plans (FMP) for all participating fields
  - Aggregate Monitoring Plan (field tracking)
    - Location, serial number, legal status, start date, verification schedule, field-level and cumulative emission reduction result
  - Field Monitoring Plan
    - Plan for monitoring all field management and tracking data
    - One FMP may be submitted (by a single project participant enrolling multiple fields), if the FMP addresses monitoring on all enrolled fields
- Single-field projects develop a Single-Field Monitoring Plan (SFMP)
  - SFMP requirements are essentially the AMP + FMP
- Table 6.1 provides detailed list of all field monitoring parameters

Reporting Requirements (Section 7)

- For aggregate projects, an Aggregate Report must submitted to the Reserve as a .csv file with accompanying documentation at verification, each reporting period
  - Includes: List of all fields and following information for each: serial numbers, acreage, start date, emission reduction results, information on which fields are new, non-eligible crop year, verified w/ site visit or desk audit etc.
- For single-field projects, a Single-Field Report must be submitted annually to the Reserve as a .csv file with accompanying documentation
  - Includes: serial number, acreage, start date, whether previously enrolled in an aggregate, and either emission reduction results or whether the field is in a non-eligible crop year

Reporting Guidelines – Reporting Period and Verification Cycle (Section 7.4)

- Annual verification required for aggregate
- Reporting period must be uniformly defined for the aggregate, as defined by the aggregator, based on fields in the aggregate.
  - Aggregate may include numerous fields with cultivation cycles that start on different dates.
    - Cultivation cycles for all fields must be complete before the aggregate undergoes verification
  - Aggregator must pro-rate emissions by:
    - Calculating the average daily emission reductions associated with a given field
    - Multiplying that average by the number of days of the cultivation cycle fall within the aggregate's uniform reporting period

Verification Guidance (Section 8)

- Verification activities occur on a random sample of fields from the aggregate and include site visits (SV) and desk audits (DA) of Field Monitoring Reports
- A field is considered verified if it is in the pool of fields in the aggregate from which site visits or desk audits are randomly drawn, even if not selected for either a site visit or desk audit
- Methodology provided for verifier to select which fields receive site visit (SV) or desk audit (DA)
- Detailed requirements for substantiating field eligibility, quantification, data accuracy, reporting, and conducting risk assessment are provided
- Defines ‘successful verification’ and procedures for handling errors
- Provides incentive for ‘self enforcement’ by defining penalties for whole aggregate based on errors found in SV and DA fields

Verification Schedule for Aggregate (Section 8.2)

- Three categories of aggregates with different verification sampling requirements based on number of fields and project participants (PP) in the aggregate
  - Small aggregate — ≤10 fields
  - Large single-participant aggregate — > 10 fields, Single PP
  - Large multi-participant aggregate — > 10 fields, Multiple PP

- Rationale for tiered approach:
  - Same approach for large and small aggregates would be overly burdensome on small or single participant aggregates

Next Steps

- Please submit written public comments by **COB May 23, 2012**
- Protocol Revised based on public comments
- Ongoing work by Reserve:
  - Completion of Appendices B and C
  - Ongoing research into correction factor for SSR 1 & quantification of other SSRs related to organic fertilizers
- Submitted for adoption to the Reserve Board, **June 27, 2012**
  - Board meeting will be open to public participation
- For more information, visit: http://www.climateactionreserve.org/how/protocols/agriculture/nitrogen-management/

Thank You

Teresa Lang – Staff Lead
213-891-6932
tlang@climateactionreserve.org

Derik Broekhoff – VP Policy
derik@climateactionreserve.org

Rachel Tornek – Credit Stacking, Support
rachel@climateactionreserve.org

Heather Raven – Coordinator
213-542-0282
heather@climateactionreserve.org

Reserve Technical Consultant
Dr. Steven De Gryze, Terra Global Capital
steven.degryze@terraglobalcapital.com
Charlotte Decock, cldecock@ucdavis.edu