

CAFO Energy & Nutrient Recovery

Measured Performance, High Impact Load Reduction

Presented to
Chesapeake Bay Program Partnership
Manure Technologies Expert Panel
Stakeholder Forum

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CAFO Energy & Nutrient Recovery Process

Ready for Review

WQGIT Protocol	Reference ENRF	WQGIT Protocol	Reference ENRF
1. Name/Title	CAFO Energy & Nutrient Recovery	9. Unit of Measure	Pounds TN and TP
2. Definition	Community scale, gasification, ammonia capture, ancillary technologies	10. Watershed Locations	CAFO prevalent areas (Central PA, DELMARVA, Shenandoah VA)
3. Loading Effectiveness	Measured Performance	11. Useful Life; Degradation	Useful life = 30+ years; negligible degradation
4. Land Uses	Storage and Land Application of Manure (non-point source)	12. Cumulative or Annual	Cumulative/continuous with real-time monitoring
5. Load Sources	Poultry CAFO (point source)	13. Performance Tracking	State-Approved M&V Plan
6. Pre-/Post-Conditions	Non-Point Source → Point Source; 4.6 million lbs-TN of recovered or converted; 1.4 million lbs-TP recovered	14. Review Timeline	Ready for Expert Panel review; Expedited review proposed by mid-2015
7. Performance Conditions	Minimal impact from storms, climate, other factors	15. Outstanding Issues	Final Air Emissions Controls
8. Temporal Performance	Full performance upon installation, commissioning, testing	16. O&M Impact	Measured performance accounts for degradation, if any

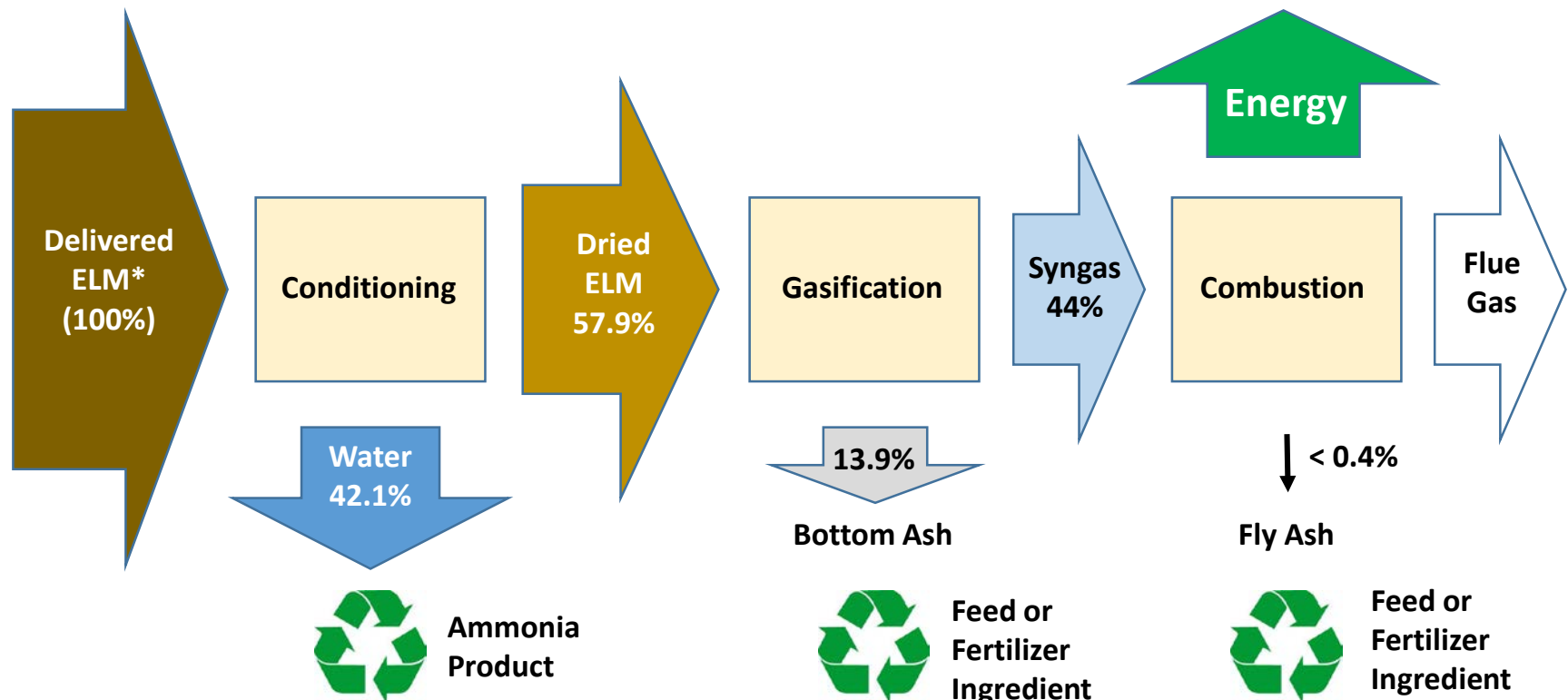
Gettysburg Reference Facility

Community Scale Technology EcoServices



Zero Waste Solutions for Large Scale Animal Feeding Operations

Sustainable alternative to manure storage, hauling and land application



* ELM = Egg Layer Manure

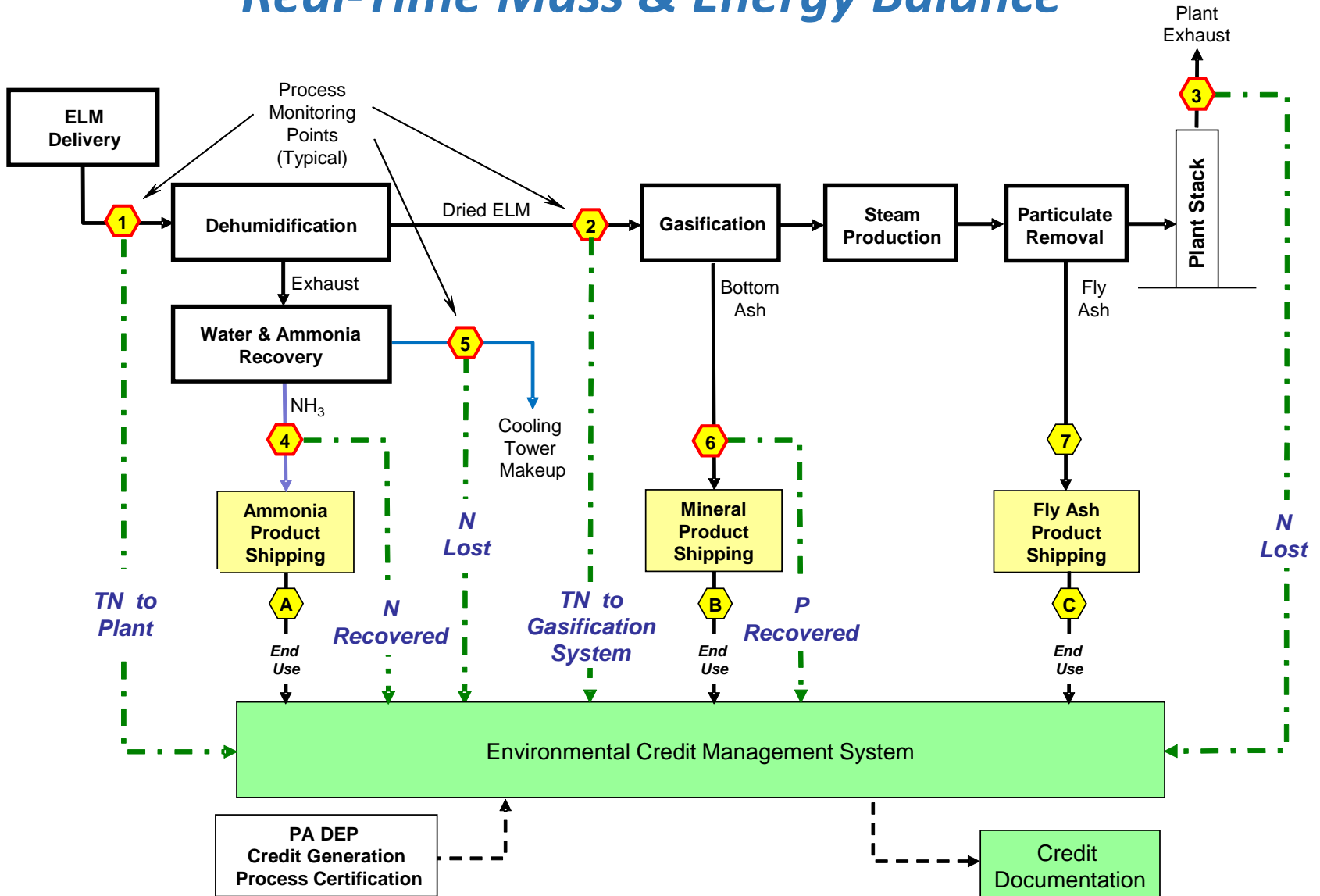
Measured Performance

Objective: Complete, accurate and reliable measurement of nutrient mass flow entering and leaving the facility

- Means and methods are specified in a state-approved Measurement & Verification Plan; includes by-product use
- Eliminates need for BMP performance models and uncertainty factors
- Components of integrated technology platforms vary according to project objectives
- Simplifies regulatory review, minimizes transaction costs
- Places performance risks and rewards with the facility operator (eliminates proprietary technology exclusion)

Typical ENRF Measured Performance

Real-Time Mass & Energy Balance



Loading Estimates

Measured nutrient reductions at the source must be translated into accepted watershed load reductions

Calculation factors include:

- Transport pathways (airborne, surface runoff, ground water)
- Assumptions regarding transport attenuation, agronomic practices and reduction additionality
- Bay Model application, including aggregation of wide area benefits from large scale systems

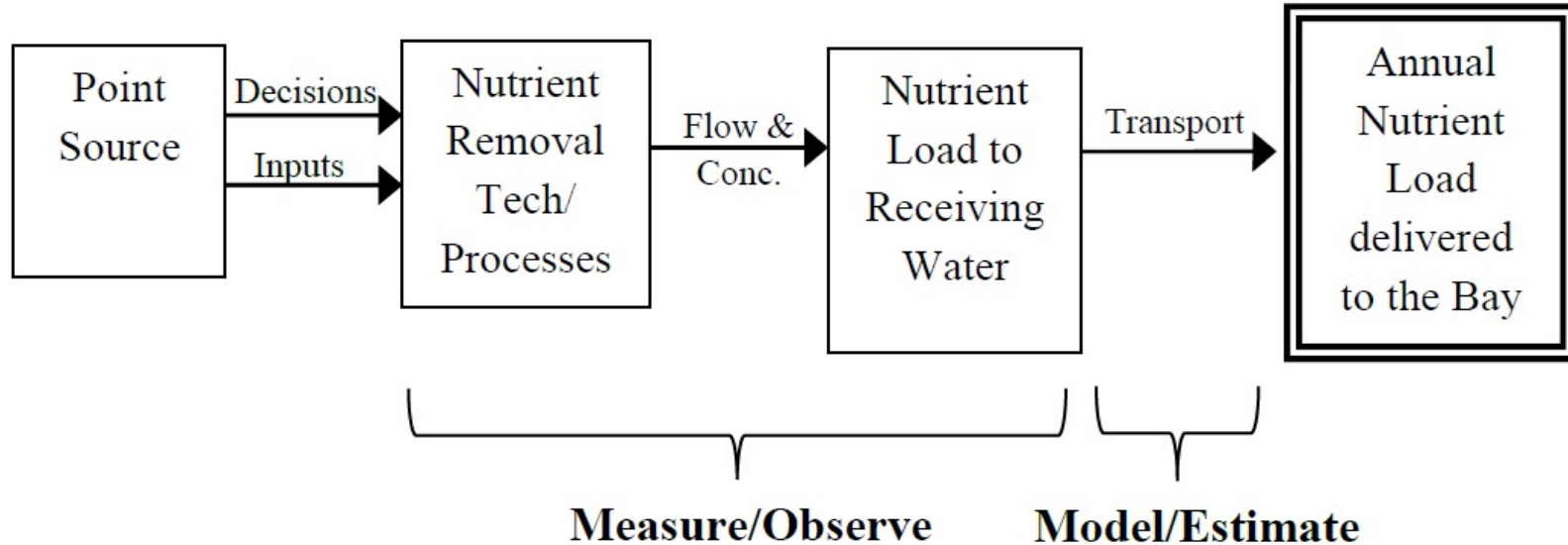
Comprehensive guidance on this matter is a critical task for the Expert Panel

Point Source Solutions

CAFOs with measured performance

- The majority of the region's animal manure is supplied by CAFOs
- Even though CAFOs are permitted as point source liquid discharge facilities, manure has volatile and non-volatile components that are released during storage and land application, resulting in significant non-point source loads
- Manure technologies with measured performance can encompass CAFO operations as point sources
- Chesapeake Bay Program Science Advisory Committee (STAC) Publication #14-002 draws clear contrasts between the uncertainties of point and non-point sources.

Figure 1. Point Source Nutrient Load (STAC Publication 14-002)

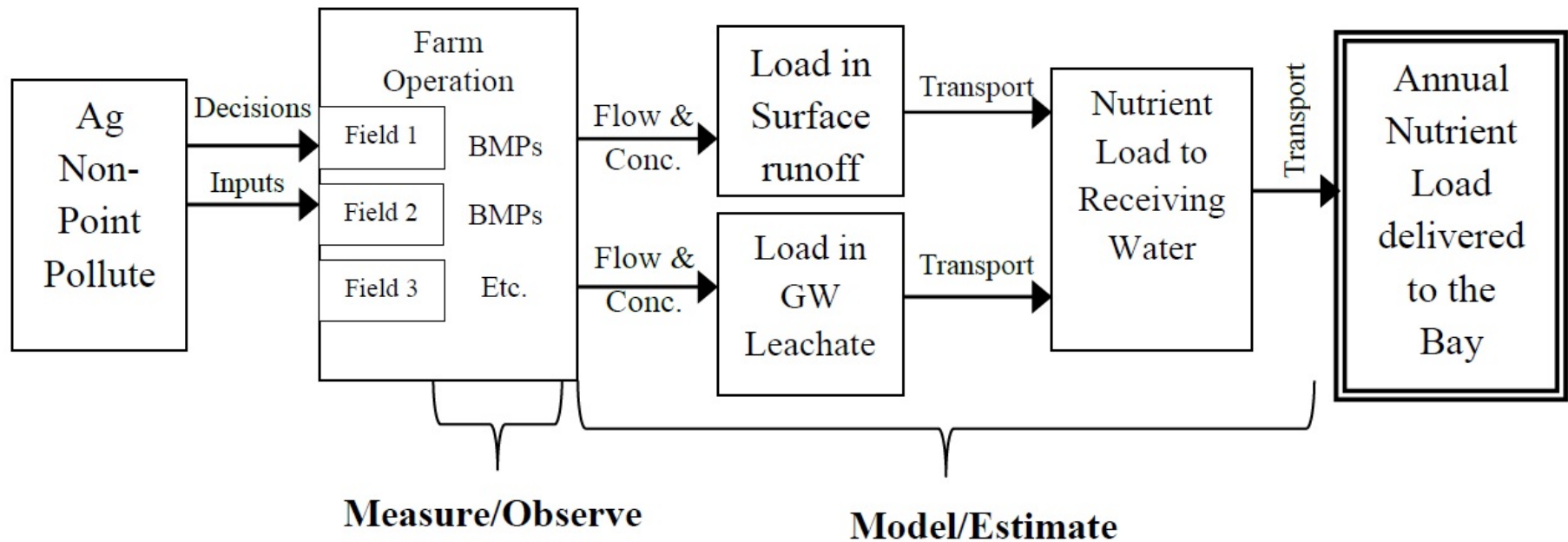


- Point Sources directly measure nutrients discharged at the source
- The primary uncertainty is the extent to which models accurately measure and represent load transport through the riverine system



This is also a critical uncertainty for private sector investment. Clear and comprehensive guidance is needed.

Figure 2. Quantifying Nonpoint Source Nutrient Load (STAC Publication 14-002)



- ***At no point in the process are agricultural nutrient loads observed or measured directly. Instead, they are estimated by imperfect models***
- Uncertainties
 1. Uncertain ability to accurately and completely measure/observe the level of BMP implementation, operation and maintenance
 2. Numerous scientific and modeling uncertainties in the ability to estimate the performance of properly implemented and maintained non-point source control practices and processes
 3. Embedded in the 'flow' and 'transport', there is uncertainty in the generation and movement of nonpoint source pollution due to the variability in weather

Cumulative Credit Generation

Independent of seasons, climate and weather events

- Thermochemical (and other) manure treatment technologies can provide load reductions throughout the year
- Performance measurement allows real-time accounting of generated credits, independent of seasonality and weather events
- In recognition of real-time accounting, limited uncertainty, and long-duration nutrient transport within the ecosystem, the shelf life of measurement-derived credits should:
 - Begin upon verification and
 - Extend beyond 12 calendar months

Expert Panel Review

*Recommendations for data collection and calculated onsite reductions**

For treatment technologies, with state-approved provisions for the routine collection of monitoring data covering all the inputs to and outputs from the combined set of treatment technologies, the Expert Panel will develop recommendations for:

- Minimum frequency of input and output data collection and
- How onsite reductions will be calculated using these monitored input and output data

* August 29, 2014 meeting with CBPO, EPA R3 and PADEP

Expedited Review of Thermochemical Technologies

“...the Partnership may recommend expediting an element of the review process...for BMP [reviews] that have immediate implications for progress or planning purposes” (WQGIT July 14, 2014 Protocol)

Expedited review of thermochemical manure technologies has immediate implications

- Thermochemical technologies provide the largest load reduction potential among Pennsylvania’s certified nutrient credit generators.
- Thermochemical technologies can facilitate implementation of Maryland’s Phosphorus Management Tool (PMT) with positive impact to the poultry industry
- Community scale applications can provide wide area ecosystem balancing to support planned expansion of regional agriculture

Area Balancing Service

Supporting area-wide nutrient management planning

