

Please find responses from Bion embedded in the document below:

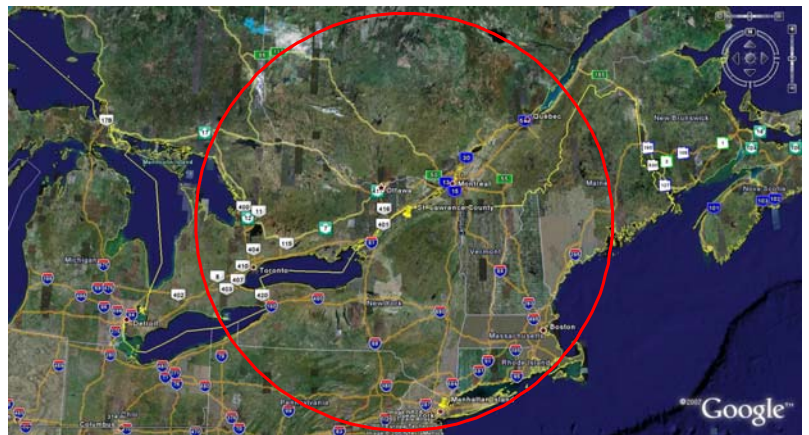
Comments on Integrated Agriculture Task Force

Submitted by Susan Powers, 5/13/08

The last task force meeting was dominated by the Bion presentation so there was inadequate time for questions from the task force. Much of the Bion presentation was rehash of materials that were already available in the various written reports that were available through Bion's own web site, and for systems that are orders of magnitude smaller than what is proposed in St. Lawrence County. Thus, while I did learn a few technical details regarding the treatment process, there was little else gained from the presentation.

Unanswered questions related to the specific implementation:

1. Bion has been unwilling to address the issue of slaughterhouse meat packing process. Yet all of their public comments about the reason why StLawCo is appropriate – distance to markets – implies that the meat processing needs to be local. The map from their presentation illustrates that their radius of markets for meat centers on NNY. I would like to hear more about employment needs and environmental impacts associated with meat processing. It seems inevitable that this would be part of the associated economic development that would occur locally, even if not coordinated by Bion.



There are two large-scale slaughterhouses in the northeastern US (both in Pennsylvania), which are currently sourcing finished cattle from as far away as Michigan and Illinois. Beef cattle finished in SLC could utilize those existing facilities until such time as a beef processing operator determined that the economic opportunity in the North Country justified placement of a state-of-the-art facility in proximity to the herd. Any such project related to beef slaughter/processing would of necessity include successfully engaging in rigorous regulatory reviews to obtain all local and state permits required. Cornell Extension employs individuals charged with the task of helping to establish livestock slaughter / further process operations in the State of New York. We would suggest that you contact those individuals to obtain additional information on the subject.

2. Water needs and water supply. Large volumes of water are required for both beef and ethanol production. Jeff reiterated that beef cattle need less than dairy, but the scale of this project means that the vast numbers of beef cattle will require a lot of water in a concentrated area. They also hinted that their ethanol production would use less water than typical because they would recycle water (1 gal water/gal EtOH rather than 4 gal water/gal etoh). A laudable goal, but no specifics on this technology were described. Details on water supply expectations are required.

Potential for water impacts are highly site specific and will be assessed when detailed process engineering and hydraulic studies for each site location are conducted. However, note that Bion

had previously provided the Task Force with a basis for a general understanding of the water usage at each of its 14,000-head beef cattle facilities stating that such usage will be “*similar to that of a 2,500 milker dairy assuming practices as currently used by operations in SLC.*”

We have also shared information related to the use and recycle of water at our proposed project activities with the SLC community. Beef cattle in confinement require about 12 gallons per head per day (gal/hd-day). 3 gal/hd-day are provided by the feed ration using wet distiller grains. Approximately 2.5 gal/hd-day will be returned to the watershed after treatment through the Bion treatment process and constructed wetlands in a condition that fundamentally meets the requirements of a surface water discharge permit -- although we have been told by DEC that as an agricultural entity, that particular regulatory mechanism is not available for use. The potential for impact to the watershed would therefore be based on a net withdrawal of 6 to 7 gal/head-day or an average net draw of 60 to 70 gal/minute for each 14,000 head facility. Of necessity, all water requirements will be an integral part of site assessment / selection, engineering and permitting. Sites lacking adequate water simply cannot be used and will not be considered.

3. I think that it is still unclear how much current and underutilized farm land is truly available for hay crops and other input needs for cattle feed. What quality of land and farming methods required to meet the yields and product quality that Bion would need? How do these needs compare to the real soil types/quality and production capacity we can really provide? Surveys have been done on farm land resources in the region and it seems that different people have different answers. I would like to hear more on this from Jason and Brent. (Bion presentation - 250,000 acres fallow cropland in SLC, Jefferson & Franklin Counties, bion needs ---hay / forage / other require an estimated 30,000 – 35,000 acres of cropland)

We agree that it is not clear exactly how many acres of cropland are under utilized in SLC, although it appears undeniable that there is at least some substantial acreage available for increased production if a long-term stable market for their output exists. The statistics we have cited concerning acreage originated with sources within the County, both agricultural and planning entities. Specifically, Bion’s project will require approximately 25,000 acres of cropland producing 3 tons dry basis per acre of grass hay annually, a level of production easily achieved by the soils on much of the land that has been taken out of production throughout the North Country over the past twenty years. Nevertheless, we also know that existing hay production throughout the North Country (Franklin, Lewis and Jefferson Counties), as well as nearby in Canada, is currently capable of producing the volumes of grass hay needed for the project’s cattle feed. Based on communications to date with individual SLC agricultural producers, it appears that many are able and willing to avail themselves of the opportunity to grow grass hay for Bion on a long-term basis and most see that opportunity to be a positive benefit of the project.

4. There are also other potential bioenergy projects that could benefit NNY and utilize the local resources for local energy needs (rather utilizing local resources and benefiting energy needs of people outside this region). For example, the St. Lawrence Co. energy Task Force has been promoting the acquisition of a community-based grass pelleting machine. For farmers to pelletize their grasses for their own energy needs and to provide a product with higher value than baled hay. How would the competition for land and hay with Bion affect the development of this proposed local and community oriented project? The thermodynamic value of burning pelletized grass and displacement of imported oil could be greater than with the proposed ethanol generation. It would be good to hear about this alternative project and its potential scale and needs (Jason, Brent ?)

We are not aware of any project based upon currently commercialized technology actually proposed for St. Lawrence County that might establish a long-term market for crops produced on under utilized cropland. It seems arbitrary at best to suggest that an actual project based upon demonstrated and commercialized technology currently being developed should be opposed in the hopes that some future project based upon a not yet commercialized technology might come along. And even if it did, we believe that most informed observers would recognize that there is sufficient under utilized farm land throughout the North Country to support both activities. And in any event, the marketplace will determine what makes the most economic sense.

5. Our Nation's energy and financial situations are rapidly changing it is not clear how viable the Bion system is given tremendous changes in prices such as corn and energy required for transportation and potential loss of ethanol subsidies. While this is really a problem for investors, does the county want to invest in "economic development" that has a high risk? As an example the E3 Biofuel facility in Mead NE shut down last November and went bankrupt after 6 months of operation and a lot of fanfare about how great this integrated system was. Their overall concept was similar (digestion rather than combustion of dried organic solids), yet technical and rising costs were too big of issues for the company to overcome. And that system was less than half the size of the proposed Bion facility.

The observation that our nation's energy and financial situations are rapidly changing is absolutely on target. That is among the primary reasons that Bion's project makes sense and appeals to investors. For one, integrated project activities will establish a permanent base biomass load of 200 to 250 dry tons per day for conversion to renewable energy (not to mention the domestic production of ethanol, a renewable substitute for petroleum based gasoline with a net energy balance projected to approach five to one due to the synergies of the integrated project). Bion's integrated approach thereby effectively "hedges" the independent risks of inputs and energy to establish a "last man standing" capability -- a significant competitive advantage. These are exactly the kinds of long-term solutions to today's changing energy and financial environment that many sophisticated investors are seeking

The concern for project transportation impacts to an overall carbon footprint seems to be more of a "boundary" problem of perception than a real issue: transportation of materials associated with project activities in SLC appear to be great because of a focus on these new local activities. However, upon consideration of total energy requirements for producing and moving both of the project's consumer products (ethanol and meat) to nearby markets in the northeast, it can be shown that there are substantial savings in both transportation cost and attendant energy use as compared with the existing industry structure for supplying these markets from the Midwest. Bion anticipates that the project will generate substantial carbon credits, based in part on the reality of these net transportation efficiencies. Note that major distributors such as Wal-Mart have now established overall environmental sustainability, and specifically the carbon footprint of the products they sell, as criteria in their selection of vendors. Bion believes that these added criteria, as adopted throughout the marketplace, will very favorably impact its integrated project in SLC.

Meanwhile, Bion directly addressed the question of E3 BioFuels in a response to the Task Force after its February meeting and we repeat that information here:

"Although it is true that E3 Biofuels has had financial difficulties (recently declaring bankruptcy), those problems are a result of equipment failure and to a large extent a lack of scale – because their

technology does not incorporate any environmental waste treatment component as does Bion's. However, from a net energy balance perspective, we have good reason to believe that Bion's "closed-loop" approach to corn to ethanol would result in a similar net energy balance to that of E3 Biofuels using the Argonne National Laboratories model. Mr. Khosla points out that that represents a better energy balance than many projections for future ethanol production from cellulose!"

It appears that the primary difficulties facing E3 Biofuels (on top of the boiler failure) have to do with their inability to achieve necessary efficiencies of scale for ethanol production (40 million gpy ethanol along with the balanced herd implied for consumption of wet distiller grains and generation of required thermal energy). Limitations of project scale are a direct result of the fact that there is no comprehensive environmental treatment capability (similar to Bion's process) associated with their integrated project.

6. Odor from both the barn and manure treatment is predominantly from a class of chemicals called volatile fatty acids. Their presentation did not adequately show concentrations of VFAs associated with their facilities or other ultra-large concentrated beef operations. A broader class of chemicals, volatile organic carbons (VOCs) were reduced by only 58% in the manure treatment process. That raises a red flag for me about VFA reduction. They did not, however present any VFA-specific data. The study conducted by Hopke et al. was sorely limited by available data and so I believe that the question of potential odors and odor reduction techniques has not yet been adequately addressed.

Starting with Dr. Power's last comment first, and contrary her assertion that the Hopke et al. study was sorely limited by available data, we would point out the following statement from the report in question: "Given the range of behavior of the odor estimation tools that are available, we believe that the values presented here from OFFSET represent a realistic estimate of the odor potential." It appears that Dr. Hopke, et al. did not believe that their results had been compromised by insufficient data or were otherwise "seriously limited".

To the question regarding emissions, the Bion biological process provides a microbial environment that specifically discourages the production of Volatile Fatty Acids (VFAs) and many other odor causing substances. Bion has measured total Volatile Organic Compounds (VOCs) and the small fraction of these VOCs attributable to VFAs (most likely far less than 2% of VOCs measured are attributable to VFAs). **Extensive emissions monitoring accepted by an independent, third party, peer review team has shown that the amount of VFAs are very low in absolute terms and substantially lower than emissions from typical manure management systems** in relative terms (seventeen (17) specific VFA compounds or species were directly monitored). When direct emissions from the Bion process are compared to those reported for the most frequently applied anaerobic lagoon system's emissions, reductions that range from 95% to 98% in VOCs are observed.

Bion has worked hard to accurately portray the true impacts of the total Bion Environmental Management System by modeling whole farm impacts with the San Joaquin Valley Unified Air Pollution Control District, which show a lower overall farm wide reduction of 58%. Given the extensive analyses of the Bion system and conditions expected for the proposed project, it would appear that the potential for substantial, or perhaps even significant, emissions of VFAs from the facility and the attendant odor problems these compounds can produce is low. All this data and analyses were made available to Hopke, Grimberg and Rogers, whose Odor Potential report found that the proposed facilities can meet desired levels for nuisance odor emissions.

The system monitoring and data collection protocols were developed with and the analyses were accepted by a nine member independent, third party review team of highly qualified environmental professionals after rigorous review. Complete resumes presenting the backgrounds of the review and advisory team are available on the Bion web site, <http://www.biontech.com/>; in the document "Technology Report (DeVries data)," Appendix B pages 65 through 113 of the document (pages 81 through 129 of the PDF document). In addition two Air Monitoring specialists from the Texas Commission on Environmental Quality observed and accepted the system monitoring and sample collection procedures on-site. Additional verification of the atmospheric emissions values reported include direct cooperation in modeling whole farm emissions with experts in the San Joaquin Valley Unified Air Pollution Control District Permitting Department, and several other regulatory entities in California.

Along with ammonia and hydrogen sulfide, volatile organic compounds (VOCs) are indeed primary odor causing compounds, (or group of compounds), emitted from manure management. Volatile Fatty Acids (VFAs) are often major sources of odors among the many species included in VOCs. The generation of VFAs from manure management typically is due to holding or storing the manure such that anaerobic conditions persist. This does not occur in the Bion management system. Manure is collected often and aeration is applied. Separated solids are promptly dried before further processing, greatly reducing opportunities for odorous emissions.

Bion has claimed reductions in emissions based on broadly available literature and regulatory guidelines. Bion has been careful to not overstate reductions by looking only at the biological processing units compared to standard practice for large installations (anaerobic lagoons) but rather realize that real reductions are to be evaluated on a whole farm basis. These whole farm reductions have been the basis for reductions presented and for voluntary emission control standards proposed by Bion.

These standards are presented in the attached memorandum "Introduction to Interim Voluntary Pollution Control Standards." Referring to Table 3 on page 7, the claimed reduction of 58% for VOCs is presented along with the basis for this conservative value, which grew out of working directly with the emissions experts in the San Joaquin Valley Unified Air Pollution Control District Permitting Department. It should be noted that VOC reduction directly from the treatment units is from 95 to 99% as determined in the DeVries study, that the reduction of 90% to 98% is based on a conservative voluntary standard, and that the 58% is from an even more conservative basis taking into consideration relatively high contributions from other manure management operations on the whole farm. The atmospheric emission modeling is outlined and tabulated in Appendix A on pages 9 through 15. Additional or supplemental work was performed to improve the sensitivity of VOC and VFA determinations as presented in Appendix B pages 12 through 15.

The supplemental study performed in July 2005 measured a broad range of emissions and their speciation in response to improved methodologies developed by California researchers after Bion's initial more comprehensive testing completed in 2004. Additional analyses were applied to determine total VOCs more accurately. Sampling methods, laboratory analysis and raw data results, and computations used to determine VOC contributions are on the Bion web site as "VOC Project Spreadsheet (July 2005)" and "VOC Project Memo (July 2005)." It may be seen that a total of seventeen (17) VFA species were sampled for. These are also listed on page 14 of the attached memorandum "Introduction to Interim Voluntary Pollution Control Standards." From the VOC Project Spreadsheet it can be seen that with the exception of acetic acid and a single very low concentration sample of propionic acid, all laboratory analyses returned "non-detects" for all of the other VFA species. The portion of VOCs attributable to VFAs (including

acetic acid) was just over 2%. This very low contribution occurs even when it is assumed that all VFA non-detects were one-half the detection limit. This supplemental study, with its more sensitive analyses for VOCs and with VFAs being speciated, increased the estimate of the more extensive study by 78%. However, when it is realized that all VOC determinations for the extended study were non-detects (conservative estimates again using one-half the detection limit for non-detects) it is very unlikely that VFA emissions were significant.

This data and analyses were available to Hopke, Grimberg and Rogers as they prepared the Potential Nuisance Odor Report. There is no mention in the Odor Report of problems preventing adequate estimates of potential odors. As previously noted, the report states, "Given the range of behavior of the odor estimation tools that are available, we believe that the values presented here from OFFSET represent a realistic estimate of the odor potential." Bion agrees with the assessments presented by Hopke, Grimberg and Rogers and that they do indeed adequately address odor potential issues at this preliminary, non-site-specific stage of project development. Moreover, Bion has committed the project to meeting the low nuisance odor levels determined by the Odor Potential Report for the facilities installed.

7. The need for CAA and CWA permits are still unclear. We need more input from Shane and DEC representatives.

Bion must address and meet all permitting requirements at all levels of regulatory oversight.

8. The Bion process at the DeVries farm is no longer operational. I would like to know why and get some direct answers from the owners of that operation regarding the reasons it is no longer operational and the effectiveness of the Bion group as a business partner and technology manager.

The Bion process at DeVries was never intended to be an ongoing commercial installation supporting the operation of the dairy farm. Rather, it was from the beginning, installed and operated by Bion with the cooperation of the host dairy in order to conduct our full-scale, third-party reviewed demonstration project. The system utilized was a long-term, yet temporary, implementation of Bion's process, designed from the beginning to support Bion's demonstration project but not intended to be a permanent installation at the dairy. For example, the various chambers for Bion's process were created by adding temporary HDPE baffles (high density polyethylene) to the dairy's existing anaerobic lagoon for the duration of Bion's demonstration project, rather than engineered and constructed as a permanent structure. In the meantime, much of the state's dairy industry has moved to the Panhandle in search of land for the disposal of its manure waste.

9. What are the real emissions to water, soil and air expected from this operation. Bion chose to not provide us with any emission data (kg/yr). Instead, they made the Bion process look great by obscuring their emission estimates as % reductions of their process relative to a similar operation with open manure lagoons. BUT – our region is not currently considering the alternative of 84000 cattle with open lagoons versus 84000 cattle with the Bion process for manure management. Thus, all of their % reduction numbers are wholly meaningless. The total emissions are required to even start to understand the potential environmental impact.

Of course there will be real emissions and nutrient discharges from these operations as there will be from any economic activity. Pertinent information has been provided to the Task Force in what we believe to be the most accessible and meaningful format for a community based review

(as opposed to a regulatory / scientific review which Bion will also fully address at the appropriate point in project development) both in written form provided directly to the Task Force as well as posted to our project website. Here is the information previously provided directly to the Task Force in our response to its February meeting:

“... the third-party demonstrated data available on our website, along with various assessments including an independent nuisance odor assessment conducted by Clarkson University scientists, consistently show that Bion’s technology converts the scale of project operations into an environmental footprint that is considerably smaller in both effluent nutrients and air emissions than that of existing dairy herds already operating within St. Lawrence County.

For example, environmental impacts from each 14,000 head beef cattle facility will compare with or be better than that of modern dairy operations as follows:

- *Water usage: 2,500 head dairy*
- *Potential for nuisance odors: a 400 head dairy (or smaller) that does not spread manure (Anecdotally, anyone who has spent time near a working dairy knows that it is during manure spreading when you get the preponderance of nuisance odors).*
- *Ammonia emissions: less than 200 head dairy*
- *Release of nutrients to area waters: a dairy with fewer than 100 head...*

But more to the point is that given the reality of demonstrated emissions reductions (i.e. ammonia reduced by 95% - 99% and hydrogen sulfide reduced by 85% - 90%) that Bion’s technology, along with careful implementation of effective site planning can and will reduce risks well below that of many existing activities already taking place within the community.”

Based on the information already provided by Bion, it can be shown that ammonia releases from the entire 84,000 head herd across multiple locations will be less than that released by 1,200 dairy cows with no spreading of manure. Contrary to the position taken by Dr. Powers, we believe that this comparative approach actually does provide a meaningful basis on which the community can realistically start to understand the potential environmental impacts of proposed activities. A purely quantitative listing of impacts (though readily available to all seeking such information) on an absolute basis without use of an understandable comparison would be of limited value to the public. For the purpose of evaluation, as previously stated, please note that every economic activity will have emissions; with that in mind, Bion believes that its agricultural activities will provide the greatest economic benefit to SLC per unit of air emissions and nutrient discharges. Notwithstanding the above discussion, site specific quantitative emissions and nutrient discharges will certainly be subject to regulatory review as the project moves forward.

10. The ultimate fate of solids from the manure treatment process is not clear. At one point, I thought that it would be recovered and sold as high value fertilizer. However, when Jeff answered a question from a person in the audience, it sounded like the solids would not be available for land spreading and thus, we would not be able to recycle the nutrients. Bion promotes the industrial ecology aspects of its integrated system (no real “wastes”, outputs from one process utilized as inputs to another). They are doing pretty well with this for carbon, but need to do better with nitrogen and phosphorus to really meet industrial ecology goals. I would like to understand better what happens to the treatment system solids and encourage their reapplication to land where additional nutrients are required.

Industrial Ecology applies the realization that integrated components of a project can benefit from allowing each component a system niche while developing each component in a way that optimizes the use of resources and energy for the collected project components. This approach produces the most economic resource utilization and environmental efficiency from the integrated business operations on a project-wide basis. The goal of maximizing the amount of nitrogen and phosphorus available for fertilizer or recycle of nutrients is not the primary goal of this project. From a nitrogen and phosphorous standpoint, the primary goal is their effective management so that environmental impacts are minimized and benign. This approach does not necessarily produce the maximum recycle of these valuable nutrients as nutrients but from the perspective of a project's industrial ecological system, provides optimum benefit. Solids and the nutrients contained will be part of the overall project design to maximize the utilization of energy and resources.

With specific regard to Bion's process, a majority of the manure solids (those with the largest particle size and cellulose content) will be captured, processed, dried and converted to renewable energy by Bion's process flow. It needs to be understood that the nutrient content of solids is generally inversely proportional to its particle size. Meaning, the coarser solids captured and used for their energy content contain a small percentage of the total load nutrients coming from the livestock relative to their quantity. Exactly how the finer solids (which are nutrient rich) and the final effluent from the process train are handled will be based upon the principals of industrial ecology and economics as discussed above, including an assessment of their value for use as fertilizer on local cropland.

The fact that this question has been raised in the first place underscores a significant misunderstanding with regard to fertilizer implications from existing standard dairy manure management and disposal practices. The question carries embedded assumptions that all or most of livestock based nitrogen is available for use on cropland and/or that greater application of nutrients to cropland is of greater benefit than more limited but more appropriately applied nutrients. This simply is not the case.

Based upon the vast preponderance of available data, the body of agricultural science literature indicates that only about 30% - 40% of the original livestock sourced nitrogen is actually available for cropping at the time that manure is spread on land. To be clear, given a sustainable use for the livestock nitrogen, Bion's system is capable of making available approximately the same quantity of useable nitrogen per head for use as fertilizer as standard dairy practices where needed and appropriate. The real measure of Bion's process flow as compared with standard dairy practice, therefore, is not quantitative, (not based upon which approach holds the potential for capturing a greater percentage of the original manure-based nitrogen for reuse on cropland) because Bion's process train can be designed to provide comparable amounts of nitrogen fertilizer when there is value for nitrogen to be used in this manner. Rather, there are two qualitative questions that really need to be fully answered:

- 1) What are the differences in potential environmental impact based on the "form" of the nitrogen that is applied to cropland?; and
- 2) What is the fate (and therefore a comparison in the potential for impact to the environment) of the "lost" nitrogen (60% - 70% of the original load at the farm) not available for cropping with both approaches?

To begin with (1), Bion's nitrogen fertilizer is no longer manure, but rather has been converted via a biological process into a single cell protein mass with the vast majority of the nutrient contained in particulate form, as opposed to soluble, and, therefore, significantly less subject to

runoff to surface waters or leaching to ground water. In addition, the anticipated 6 fold or greater pathogen kill provided by Bion's process will substantially reduce risks related to the introduction of pathogens to the watershed.

Second (2), the fate of the "lost" nitrogen is significantly different with Bion's process as compared with standard practices. Studies have consistently shown the escape of 50% - 60% of the nitrogen from standard dairy practices in the form of ammonia through the process of volatilization to air. This volatilized ammonia is for the most part subsequently reintroduced to regional water bodies through a process called wet deposition. In Bion's process, only about 5% - 10% of the original nitrogen is lost through ammonia volatilization on a whole farm management basis with the remainder converted to harmless N₂ gas or captured in the various streams of solids. It turns out that the reduction in ammonia volatilization is one of the primary sources of nutrient credit generation in the protocols as approved for Bion's process by the Pennsylvania DEP.

It is for these reasons, among a host of additional environmental benefits, that Bion's technology represents the kind of new approach to large-scale animal production called for in the key recommendations of the recent extensive Pew Commission report on that subject.

http://www.pewtrusts.org/uploadedFiles/wwwpewtrustsorg/Reports/Industrial_Agriculture/PCIFAP_FINAL.pdf

11. At the very end of the last meeting Jeff read an analysis of transportation impacts. I could not follow all of the verbal explanation of this operation compared with dairy farms. That document needs to be available and reviewed by someone qualified.

We had left a copy of the transportation statement with staff for distribution to the Task Force and understand that Mr. Montan had included that statement in full in the distribution of the minutes from the April Task Force meeting.

Overall – I think that the task force needs to move much more aggressively at hearing from other stakeholders involved or impacted by this proposed. Specifically:

- DEC (air and water permits)
- Hydrologist (???) – water availability, soil capacity necessary for planned irrigation of ALL water from treatment system (Bion claims they will have a zero discharge system)
- Dr. Phil Hopke – results of air quality study and real interpretation that can be made from that
- CCE and others regarding availability of land suitable for addition cattle feed
- Farm groups (Farm bureau, NCGC etc) to hear how this would impact their operations
- Environmental groups (Audubon, Save the River, etc)
- Farm owners who have previously worked with Bion and have experiences we could learn from
- OBPA – can they handle the expected corn delivery at the rates proposed by Bion?
- St. Lawrence Co. engineer or highway department regarding the impact of increased traffic on our roadways. If they need to be upgraded, who pays?
- General public – there has still not been a open public hearing on this project. There could be other important stakeholders

