Appendix D: Economics Subcommittee Reports

(Please note: This section contains a majority report followed by a minority report.)

Majority Report from the Economics Subcommittee of the Advisory Panel to the Designee Under the Agreements between Attorney General of North Carolina and Smithfield Foods, Premium Standard Farms and Frontline Farmers Regarding Recommendations on Economic Feasibility Determinations

December 1, 2005

Economics subcommittee members whose comments are reflected in this report:

Chantal Line Carpentier, Ph.D.
Chef, Environnement, Économie, et Commerce,
Commission de Coopération Environnementale
Montréal, Québec

Joe Rudek, Ph.D.
Senior Scientist
Environmental Defense
Raleigh, NC

Bruce Gardner
Distinguished University Professor
Dept. Agricultural and Resource Economics
University of Maryland, College Park, MD

V. Kerry Smith
University Distinguished Professor
Dept. Agricultural and Resource Economics
N.C. State University, Raleigh, NC

Art Rios, Economist
Innovative Strategies and Economics Group
U.S. EPA/OAQPS/AQSSD/ISEG
Research Triangle Park, NC

Richard Whisnant, Chair
Assoc. Prof. of Public Law and Government
School of Government
UNC Chapel Hill, Chapel Hill, NC

Four other subcommittee members are submitting their comments under separate cover

Table of Contents

Memo

To: Dr. Charles Michael Williams, Designee
From: Richard Whisnant, Economics Subcommittee Chair
Re: Economic Feasibility Determinations
Date: Dec. 1, 2005

You have asked this subcommittee to make recommendations on applying the economic criteria required for environmentally superior technology determinations under the Smithfield, Premium Standard Farms and Frontline Farmers Agreements ("Agreements"). I have summarized below a recommended methodology for making economic feasibility determinations. This methodology is supported by the majority of the subcommittee, and except in the important case of the threshold for "competitiveness," by substantially all the committee members. [1] In the case of the threshold for "competitiveness," four members of the committee disagree with this report's recommendations and instead recommend a standard of "no net increase in costs." This report includes comments by the six subcommittee members who support this methodology. The other four subcommittee members have requested to write separately.

There are two preliminary matters (headings 1 and 2 below) you should consider, followed by three headings regarding the Task 1 cost data, the Task 2 equilibrium displacement model, and issues concerning timing, phasing and financing of conversion, respectively.

1. Economic versus financial points of view on feasibility: both are important to a determination of "economic feasibility" as required by the Agreements

The Agreements instruct you to consider "all relevant information" in determining whether it is economically feasible to construct and operate a particular alternative technology for a given category of farms. The Agreements identify certain factors to be considered in evaluating economic feasibility, but

---

[1] In addition to this disagreement, subcommittee member DiPietre, on behalf of Premium Standard Farms, has stated that he has other, more generalized disagreements with the report. See his comments and those of Dave Townsend in their separate submission.

the Agreements explicitly state that this list of factors is not an exclusive list. Further, nothing in the Agreements indicates that any one or more factors are "dominant" or "primary" factors.[2]

The explicitly listed factors include "costs," which is an economic term of art that essentially means "a commitment of scarce resources without regard to who owns the resources being committed," as well as "revenues" and "monies," which are financial terms of art that imply consideration of how cash flows would be changed for persons affected by deployment of an alternative technology. In other words, the Agreements require attention to both the true economic consequences of alternative technology adoption, as well as the financial consequences for persons affected. Economic "costs" are social costs that include both monetized commitments of resources, such as capital invested in new equipment, as well as non-monetized commitments of resources, such as time invested in learning to operate new systems, undesirable external effects such as ammonia emissions, odors and water pollution. Note the costs in the model developed by NCSU-ARE do not include social costs –a partial and uncoordinated set of estimates was developed by RTI; these were uncoordinated because they had to be finished before the technologies were operated for sufficient time to provide estimates of emissions. Financial consequences focus more narrowly on payments made by farmers or payments received by technology suppliers. There are places in the following discussion and in making economic feasibility determinations under the Agreements where it is important to keep separate attention on the economic versus the financial consequences of alternative technology adoption. Ultimately, however, both perspectives are important, as the Agreements make

[2] Four members of the committee (see Memo from Bart Ellis et al. to Richard Whisnant and Mike Smith, Nov. 22, 2005, on file with Whisnant) believe the meaning of the Agreements can and should be interpreted in light of their understanding of the subjective views of negotiators of the Agreements. In addition to the many interpretive problems such an "intentionalist" reading raises, such as whose subjective view of the meaning of the Agreements controls, the Agreements themselves largely dispense with this argument by the "integration" clause, clause H, which says that the text of the Agreement is itself the entire agreement among the parties and supercedes any and all prior discussion, understandings, negotiations, etc.

clear, so that 'economic feasibility determinations' under the Agreement require a broad consideration of impacts.

2. *How to understand "the North Carolina pork industry" for purposes of economic feasibility determinations under the Agreements*

Another threshold consideration is "who counts as 'the North Carolina pork industry.'" The Agreements explicitly require you to consider the impact that adoption of alternative technologies may have on the competitiveness of this group of persons. This industry includes any and all business entities physically located in North Carolina that generate their income from either the production of live swine or the meat packing of pork. Thus, like "economic feasibility," this term is a broad one: it includes not only farmers who raise swine, but also meat packers, technology suppliers to farmers and meat packers, and even lenders and other entities whose commercial livelihood is closely bound up with pork production.

The North Carolina pork industry has grown incredibly quickly over the past twenty years. North Carolina hog inventories in 2005 are approximately 313% higher than in 1985.[3] Much of this growth occurred from 1991 to 1995, when inventories rose at an annual rate of around 30%.[4] North Carolina's share of U.S. slaughter volumes rose from 2.9% in 1989 to over 10% in 2001.[5] These extraordinary increases might have been even higher without a moratorium on new swine production implemented in 1997.

Further, these rapid increases in inventory occurred during and after the imposition of state-led regulation on the livestock industry in 1993, in the ".0200 Rules," which, among other things, required producers to develop and follow an approved waste management plan using best management practices of the North Carolina Soil and Water Commission or the U.S. Department of

---

[3] Murray and Wohlgenant, A Profile of the North Carolina Hog Industry in Relation to U.S. and International Markets (RTI 2003) at 1-1.

[4] Blue Ribbon Study Commission on Agricultural Waste, Report to the 1995 General Assembly of North Carolina (1996 Regular Session) ("Blue Ribbon Report") at 1.

[5] Id. At 5-2.

Agriculture.[6] Estimates given to the Blue Ribbon Commission in 1996 suggested that 25 to 33% of the State's dairy operations and 12% of the State's swine operations would not remain in business after implementation of the .0200 Rules.[7] Nevertheless, the regulators and the General Assembly continued with implementation of the .0200 rules, indicating a willingness to accept a 12% reduction in swine operations in order to gain better waste handling. We believe this same range of predicted reduction in herd size from the present (larger than in 1996) herd would be 'economically feasible' under the Agreements.[8] Note that reductions in swine herd size of greater than 12% might be justified as economically feasible from a social costs versus social benefits point of view; one committee member's calculations suggest that the benefits of environmentally superior hog waste technology would justify social costs of better technology at a level predicted to produce a 20% reduction in herd size.[9]

The 1990s increases in swine inventory were all the more extraordinary given that pork is a commodity, produced under competitive conditions. The competitive, commodified nature of pork production, however, does not necessarily extend to pork processing, where locational advantages and brands may produce market power. The extraordinary growth of the pork industry in late twentieth-century North Carolina can be and has been plausibly attributed to several advantages, some of which are reasonably inherent and thus are likely to persist even with adoption of new waste technologies, others of which are clearly temporal and are already diminishing. More or less inherent advantages include the proximity of major processing facilities in the State to markets all along the United States eastern seaboard and the climate. Since

---

[6] 15A N.C.A.C. 2H.0200. The regulations changed waste handling requirements for swine operations with 250 or more animals.

[7] Blue Ribbon Report at 33 (dairy) and 50 (swine). Swine operations were predicted to shrink from 3,822 to 3,375 (a reduction of 11.9%). Note this was a predicted reduction in operations, not in inventory. The report gives no information on whether this drop in operations would equate to more or less than a 12% drop in inventory.

[8] This is the recommendation that four members of the subcommittee explicitly disagree with. See generally Memo from Bart Ellis et al. to Richard Whisnant, Nov. 22, 2005 (on file with Whisnant).

[9] See Memo from Joe Rudek to Richard Whisnant, Nov. 11, 2005, at pp. 3-4.

transportation of finished hogs to slaughterhouses is a significant cost factor, and increasingly so as petroleum prices increase, there is an advantage to producers located close to these processing facilities. These comparative competitive advantages of the North Carolina pork industry will persist whether waste handling costs increase or not. Other advantages that account for the extraordinary growth in North Carolina swine production in the last twenty years are innovations in business practices and technology (e.g., contract growing, housing, genetics) that have allowed economies of scale previously unknown to pork producers. There is no reason to believe these advantages will persist; in fact, it is reasonable to expect that North Carolina's share of national and world markets will decrease whether or not new technology is adopted, as other production locations scale up their operations. There are also comparative disadvantages to the State's swine industry relative to midwestern and western United States and Canadian producers, including proximity to the "corn belt" and large areas of open space with few population centers.

This industry is very important to North Carolina, and particularly to a region of North Carolina (the inner coastal plain) that has very few other options for economic prosperity. The economic impact of the industry in terms of jobs and income is huge.[10] Note, however, that committee member Smith and co-author Carol Mansfield have conducted an economic impact analysis of the coastal tourism sector using the same type of model as the Task 1 team, and Smith and Mansfield found higher output multipliers for tourism activities; this would imply that if the hog sector causes impacts that reduce the attractiveness of eastern NC for tourism there is also an impact in terms of secondary output and jobs. The employment multipliers were smaller for tourism.[11]

---

[10] From 1988 to 1992, per capita income in Sampson County rose from 83% of the State average to 102%; Duplin County's rose from 78% to 92%. Blue Ribbon report at 2. In 1996, Dr. Kelly Zering estimated the total economic impact of the swine industry in North Carolina to be $3 billion, $1 billion of which stayed in North Carolina. Id. At 32.

[11] Mansfield, Carol and V. Kerry Smith (2002), "Trade-off at the Trough: TMDLs and the Evolving Status of U. S. Water Quality Policy," in *Recent Advances in Environmental Economics*, edited by J. A. List and A. de Zeeuw (Cheltenham, U. K.: Edward Elgar Publishing).

The future competitiveness of the State's pork industry will be driven by many factors, including those noted above, and within this set of drivers, waste handling cost is just one component. The benefits of environmentally superior technology make some level of increased costs (at least those estimated to produce a herd size reduction of 12% or less) economically feasible. Some effort has been put into estimation of benefits in connection with the Agreements, but no quantified cost/benefit calculation has been carried out for any of the proposed technologies. In general, however, the range of benefits predicted to flow from adoption of environmentally superior hog waste technology appear to justify the range of costs that would yield a predicted herd size reduction of 12%. From one point of view, which treats economic feasibility as a comparison of social costs and benefits from a given change,this makes the incremental costs associated via the Wohlgenant model with a 12% herd size reduction economically feasible.[12]

Past policy and experience with other rules suggest that reductions of 12% in the pork industry have been accepted by the State of North Carolina, without any appreciable diminution in the competitiveness of the state's pork industry. It may be that larger reductions could be tolerated or that today's circumstances are sufficiently different from that past experience that a smaller amount is all that could be accommodated. In both cases, however, the burden of proof rests with those who wish to argue one way or the other. Twelve percent is within the range of recently predicted experience. There are no objective standards that can be derived from economics to specify a numerical value for the scale of a sustainable industry within a single state. It is possible to comment on the overall impact of using a 12% rule from a social efficiency perspective. The range of reductions in external effects likely to flow from adopting environmentally superior hog waste technologies that are estimated to lead to this herd reduction also generate benefits for citizens of the state. The magnitude of these benefits is large enough to more than justify the added costs

[12] See, e.g., Memo from Joe Rudek to Richard Whisnant, Nov. 11, 2005, at pp. 3-4.

of waste management. This amounts to economic feasibility from the social perspective.

This is not the sole rationale proposed in this report for the 12% threshold, but it is a useful touchstone since the weighing of social costs and benefits is fundamental economic rationality. As noted above, however, the Agreements also require consideration of the actual impact of technology adoption on producers in North Carolina, and this consideration in turn requires attention to matters such as financing and phase-in times for technology conversion.

3. How to compare the projected incremental, annualized retrofit costs for each technology with the calculated cost of a lagoon and sprayfield system

The cost data for each technology and the baseline are well-reasoned and well-justified and can be taken as a given, with the understanding that there is significant uncertainty about each cost estimate, due to the necessity of assumptions about and adjustments made for, among other things: the scale of production, cost reductions related to knowledge gained in the prototyping of the technologies, the value of byproducts, the ten-year (+/-) life assumption and the discount rate. For any given technology and the baseline, further data about one or more of these variables might lead to an adjustment in the expected cost or in how the expected cost data are used.

There are economic issues raised by the assumptions made in producing the cost data that could be important in evaluating a technology that is a "close call" as to economic feasibility. Two important issues identified and discussed by the subcommittee are the 10-year working life assumption and the 8% discount rate. The actual useful life of components of the various technologies and of the lagoon and sprayfield system will be shorter or longer than ten years; the result of the 10-year assumption is to bias the costs against technologies with long useful lives (by ignoring the residual value of those technologies at the end of ten years) and to bias the costs in favor of technologies with shorter

useful lives. The effect of the 8% discount rate, a relatively high rate,[13] is to bias the estimates against technologies with relatively lower costs (or with higher benefits, such as byproduct revenues) that are incurred later in the ten year estimation period, as compared to technologies that have lower up-front costs but greater deferred costs. Neither of these assumptions undercuts the overall usefulness and validity, for your purposes, of using the cost estimates generated by the Task 1 team, as the team's model allows both working life and discount rates to be varied. Thus it is possible to generate sensitivity analyses for any given technology to confirm that the choice of working life assumption and discount rate are not unduly influencing the technology determination.[14]

4. *How to assess "the impact that the adoption of alternative technologies may have on the competitiveness of the North Carolina pork industry as compared to the pork industry in other states."*

In understanding the competitive effects of adoption of a given alternative waste technology, it is important to keep in mind that North Carolina producers (as elsewhere) actually have a range of operating costs. The modeling done to support the Agreements and your technology determinations works from average costs, which is a reasonable approach for making industry-wide estimates. But in reality there are low-cost producers and high-cost producers, and the actual range of cost differences between them could be rather large.[15] If new waste technology costs are imposed on North Carolina pork producers, those producers with the least efficient current operations will face the greatest risk of going out of business. Production will shift to out of state producers and

---

[13] For example, the U.S. Office of Management and Budget recommends using a real 7% discount rate for policy analysis purposes, and for certain investment and cost-effectiveness analysis purposes, the real rate for a 10 year investment would be as low as 2.5%. U.S. OMB Circular A-94 & App. C (Jan 2005).

[14] See Memo from Joe Rudek to Richard Whisnant, Nov. 11, 2005, at pp. 1-2 for an example of the sensitivity of Task 1 cost estimates to lifetime, discount rate and overhead assumptions.

[15] Estimates from Iowa suggest as much as 30% variation between the highest-third and lowest-third cost producers. Economic and Structural Relationships in U.S. Hog Production. William D.McBride and Nigel Key, Resource Economics Division, Economic Research Service,U.S. Department of Agriculture. Agricultural Economic Report No. 818 (Feb. 2003) at 11. North Carolina producers' cost information was apparently not supplied to researchers in conjunction with the Agreements.

to in-state producers that are still able to operate at a profit. The pork industry will grow more efficient as a result, since more of the external costs will be minimized and internalized.

Another important aspect of the variation in costs faced by producers across the country and the globe is that there are already existing cost differences from state to state, given different tax and farm subsidy programs at state and local levels, different transportation regulations, different labor laws and different health and safety laws. If it were true, as a minority of the subcommittee argues, that any increased costs in a given state would render that state's pork industry "noncompetitive," then the only place where pork production was competitive would be in the state with the lowest net costs (costs minus subsidies). But that is empirically untrue; many states in the United States have pork production that is able to compete in the sense of remaining economically viable, and there is simply no evidence that these cost factors are determinative in the geographic distribution of commodity production.[16]

Dr. Wohlgenant's model, created pursuant to the Agreements, estimates the resulting changes in the quantity of production in the State given a certain increment in costs (Task 1 output) and a certain baseline for costs. The model is an excellent and necessary component for analyzing the effects of a technology determination on the competitiveness of the North Carolina pork industry. It is a useful device for estimating the size of impacts on the swine herd in the State at different levels of incremental waste handling costs.

The following table illustrates the magnitude of projected North Carolina herd size decreases given a certain level of increased waste handling cost:[17]

---

[16] For further explanation of this point, see Email from Bruce Gardner to Richard Whisnant, Nov. 18, 2005.

[17] As discussed in the last section of this memo, the predicted (Task 1) costs should be discounted for any delayed implementation. This is an example of how economic costs that are estimated without regard to actual financial incidence can be misleading if not adjusted to reflect actual cost incidence, when they are interpreted for their distributional consequences.

Task 1 output cost	ΔShort run (model output)	ΔInt. Run (model output)	ΔLong run (model output)
~$89	-3.0%	- 9.5%	-12%
~$115	-4.5%	-14.0%	-18%
~$146	-5.8%	-18.4%	-24%

Based on these numbers generated by the Wohlgenant model, an increase in waste handling costs of $89 per 1000 pounds of steady state live weight would result in a predicted long-run reduction in the North Carolina swine inventory of 12%.[18] For comparison sake, this would reduce the current inventory of around 10,000,000 hogs by 1,200,000 hogs, back to the approximate size of the inventory at the time the 1997 moratorium went into effect. In fact, of course, hog inventories increased substantially after implementation of the .0200 rules, despite the additional costs. For many reasons, the size of effects predicted by the Wohlgenant model may have little relationship to the actual herd size in North Carolina, after implementation of alternative waste technology, since other factors (market factors, lifting of the moratorium, increased regulation in other states and countries, and the huge uncertainty in the model itself) will likely be more important determinants of actual herd size. The model remains, however, the best available estimate for technology determination purposes.

"Competitiveness" does not mean maintaining the present hog inventory size and, by the express language of the Agreements,[19] does not mean avoiding any net increase in waste handling costs in North Carolina. The state's hog inventory size has and will continue to vary annually, even with the moratorium in place, by amounts similar to the 9.5% reduction predicted over the

[18] Note well that this figure should be further discounted to account for the time value of money, if there is a delay in implementation. These numbers, in other words, assume the costs are actually incurred today.

[19] "The parties understand and agree that alternative technologies that cost more than the lagoon and sprayfield system may be determined to be economically feasible." Agreements ¶ 4 (c).

intermediate term for an $89 present incremental cost.[20] "Competitiveness" means assuring the *economic viability* of the NC pork industry as compared to other states *as far into the future as possible*. The real question underlying competitiveness is not simply the number of hogs, but also factors such as the profitability (return on investment) for those in the industry and the sustainability of communities in which producers live and work. The number of hogs might be taken as a proxy for profitability and sustainability under some assumptions, but it is a poor proxy at least within the range of variation contemplated as "economically feasible" under this recommended approach (up to 12%). First, oversupply of hogs is a major threat to profitability for pork producers, so maximizing the number of hogs cannot equate to maximizing producer welfare. Second, since "the North Carolina pork industry" includes suppliers of alternative waste technology, payments made by producers and taxpayers for new waste technology stay, to some extent, within the industry. It is conceivable that development of alternative waste technology under the Agreements could spawn a new set of industry leaders in waste handling technology, centered in North Carolina, and it is entirely plausible that other states and countries will, in the future, look to this industry to supply them with waste handling technology. Third, this scenario for future competitiveness of the North Carolina industry is more than just plausible, it is likely to occur, when viewed from this economic perspective: the costs of hog production include the external (pollution) costs, and as long as those costs are being imposed involuntarily on people, communities and businesses outside the farm operation, there will be contingent liabilities (risks) facing the industry. It is only when those costs are substantially eliminated or are internalized that the industry will escape the risk of regulatory change designed to capture the costs. By staking out a reasonable technological and economic approach to implementation of improved waste technology, the North Carolina pork industry could gain the sort of long-term stability in regulatory setting that is valued by

[20] During the five years since the Agreements were signed, all under the moratorium, inventories have fluctuated at least 7.5% (2001: 9,300,000 head; 2003: 10,000,000 head).

investors. The simultaneous development of market leaders in design and construction of environmentally superior waste handling technology would further diversify the North Carolina pork industry.

5. The critical importance of phasing, timing, and financing of farm categories in assessing economic feasibility under the Agreements

The key to this "reasonable technological and economic approach to implementation" is a rational scheme for further, larger-scale testing and phased-in deployment of the technology we now know to be environmentally superior. This involves considerations of phasing, timing and financing. The Agreements allow you great flexibility in these critical implementation choices. By selecting farm categories appropriately and making determinations conditional on adequate periods for amortization and adequate financing, it is possible to ensure that most or all of the studied technologies are economically feasible.

Phasing—It would be useful and economically appropriate to implement new technologies determined to be environmentally superior in phases, allowing pilot testing and refinement of the technologies before they are adopted industry wide. Two categories of farms that are obvious candidates for initial pilot testing of environmentally superior technologies are (a) new farms, and (b) company owned farms. New farms do not face the financial dilemma that existing farmers face in having invested already in a waste handling system, only parts of which may continue to be useful when superior technology is deployed. Thus the "Greenfield assumption" problem noted above in discussion of the Task 1 cost figures is not a problem for new farms. The impact on company owned farms has been modeled explicitly by Prof. Wohlgenant, so it is possible to apply the recommended "less than or equal to 12% long term reduction" criterion directly. It is important to note, however, that the Wohlgenant model's outputs of percentage change for company owned farms expresses herd reductions as percentage of the *company's* original herd, not the state's herd as a whole. Thus to apply the 12% rule, one must make a further adjustment to the Wohlgenant outputs by discounting for the percentage of the state's herd represented by the

category of company farms being considered. For example, the Wohlgenant model predicts a 100% reduction in company-owned feeder-finish farms with more than 2000 animal units from adoption of a technology costing $305.96 per 1000 pounds steady state live weight. But this is 100% of the company's herd, not 100% of the entire herd in the state for that category of farm. Comparing Table VI.78 (company owned farms) to Table VI.26 (all farms), one sees that company owned quantities (17,213.58 K.lbSSLW) are around 40% of the total state quantities (43845.60 K.lb.SSLW). Thus a 100% reduction in company owned quantities from a given technology would equate to a 40% reduction in the quantities produced in the state as a whole. If you deem it useful and appropriate to consider company owned farms as a separate class of farms for designation purposes, then you must adjust the Wohlgenant model numbers as shown above in order to assess economic feasibility against the 12% rule.

It is also important to recognize that appropriate phasing will lead to lower costs and industry impact than predicted in the Wohlgenant model. In that model, each technology is judged as if it was in isolation from others. In fact, the heterogeneity in individual farm (and firm) costs and circumstances noted above and appropriate phasing will allow, to a greater or lesser extent, each farm to be the best judge of its individual circumstances and thus to select from among the technologies judged to be environmental superior and economically feasible the one best for its special conditions. A set of such heterogeneous decisions from among these technologies will generally lead to a smaller overall impact than the fixed threshold used for each of them in isolation in the model.

Time frame—in accord with the suggestion to phase in adoption, it is important to consider the time value of money in assessing the economic feasibility of a given technology. The more delay, the more time a producer has to earn returns/amortize his existing investment in waste handling. Thus giving additional time for implementation raises the threshold of economically feasible predicted herd size effects from 12% to some higher number, the exact point being beyond the ability of the models constructed for this exercise to quantify.

Institutional considerations – Finally, there are institutional considerations, the details of which are beyond the scope of this committee, but that should be studied in conjunction with implementation planning. For example, an institution created to oversee the technology transition could achieve greater efficiency by having a system of tradable permits, so that producers had a choice of converting or buying allowances to continue with their present technology and converting only when it became more cost-effective to convert. This could help ensure that the phasing of farm conversion occurred in the most economically rational manner. Similarly, there may be carbon tax credits, technical assistance and many other features of conversion that are best handled by some institution charged with overseeing the process, rather than simply expecting the market and individual producers to sort it out on their own.

From: Chantal Line Carpentier [clcarpentier@cec.org]
Sent: Thursday, November 24, 2005 3:24 PM
To: Whisnant, Richard
Subject: RE: Whisnant draft econ feasibility report ver 2

Richard,
I must apologize for my late comments and lack many of my colleagues congratulate you on this very useful report.
The advantage of coming late is that most of your comments have already been made and this case is no exception.
My reading of the agreement is the same as yours and many of my colleagues on the committee --EST can increase private costs to some producers in the state and being economically feasible. It is also false to assume that only NC farms will adopt these technologies and the longer the phasing in of technologies on NC farms the more fallacious it becomes.

Specific comments:
Shouldn't you say there are "5" and not two preliminary matters on p.1 before section 1.?
P3. you have twice meat packers.
I would change Huge on page 4 for large, even if $3 billion is one estimate found in the literature. Some estimates of the impacts of the current technology on the tourism and fishery industries seem to be in the same bulk part.
As I have argued at the last meeting and many time in the past, I would not include the long term column on p.8 given all the uncertainties associated with the long run (adoption of ETS by other states, subsidies and support programs, quick development of by-product markets -- none of which is included in the Task 1 estimates which drive Task 2 results).
P.10 Alternative technologies providers in the state will be in a privileged position to meet raising demand in other states as well.
P. 11 Greenfield assumption' problem noted above in discussion of the Task 1 cost….. should be revised since you seem to have deleted that section from Task 1.
In he Institutional considerations and phasing sections, I wonder if we should not note that special attention should be paid to economically healthy smaller producers to ensure they are not been put out of business because of a cash flow problem in adopting EST.

Congratulation again for your great work and thank you for your patience,
Chantal Line

Chantal Line Carpentier, Ph.D.
Chef, Environnement, Économie, et Commerce,
Commission de Coopération Environnementale
393 St-Jacques Ouest, Suite 200
Montréal, Québec, H2Y 1N9
(514) 350-4336, Fax: (514) 350-4314

arriba mencionado.

<http://www.cec.org/bibliographies>

From: Whisnant, Richard [mailto:whisnant@sog.unc.edu]
Sent: Wednesday, November 23, 2005 3:57 PM
To: Chantal Line Carpentier; reason; bartellis; kerry_smith; joe_rudek; Dave.Townsend; Bundy Lane; Art Rios; Bruce Gardner; Dennis DiPietre
Cc: Brenda Boykin; cmw@ncsu.edu
Subject: RE: Whisnant draft econ feasibility report ver 2

Dear Econ Subcommittee,
here is my ver 2 (and, I hope, my final version) of the econ subcommittee report from me. As you will see, I have addressed a few (not all) of your comments, mostly in footnotes. My plan is to submit this in a package with all of your comments on my version 1 to Mike, for distribution to the full committee, by December 1. If any of you want to make changes in or withhold any or all of your previously submitted comments from this final distribution package, just let me know prior to Dec. 1.

Thanks again for all your efforts. Have a happy, safe Thanksgiving....

Richard

Richard Whisnant
Assoc. Professor of Public Law and Government
UNC School of Government
Campus Box 3330
Chapel Hill, NC, USA 27599
919.962.9320

-----Original Message-----
From: Whisnant, Richard
Sent: Thursday, November 10, 2005 4:32 PM
To: 'carpentier'; 'reason'; 'bartellis'; 'kerry_smith'; 'joe_rudek'; 'Dave.Townsend'; 'Bundy Lane'; 'Art Rios'; 'Bruce Gardner'; 'Dennis DiPietre'
Cc: 'Brenda Boykin'; 'cmw@ncsu.edu'
Subject: Whisnant draft econ feasibility report ver 1

Dear Econ Subcommittee:

I've attached my draft comments on economic feasibility. "Draft" because I am open to changing language that you find problematic if you can convince me why it's wrong. Before noting the core disagreement that exists in the committee, let me point out that there is substantial agreement that (1) the Task 1 work is

good and the cost estimates are useful, caveating the concern some of you have about the "greenfields" assumption and also caveating the fact that for "close call" technologies, it is worth considering the degree to which the 10-year working life and the discount rate assumptions drive the estimate; (2) the Wohlgenant model is good and a useful basis for predicting changes in NC herd size from a given incremental cost; and (3) considerations of timing, phasing, and subsidies/financing could be important determinants of "economic feasibility." I have tried to pick up particular language on each of these issues from the comments submitted thus far, and it is as to these things that I am most interested in revisions to my draft that you think are needed before you could agree with the draft.

As you will see, I take issue with the position of Bart, Bundy, Richard and Dennis that, as Dennis put it, "the adoption of an EST which raises the net cost of production in North Carolina is not economically feasible." This is a core issue, of course, in Mike's Technology Determinations, and I take it as a given, based on the comments submitted thus far, that we will not reach consensus as a committee on this core issue.

I am therefore asking those of you on the subcommittee who have not separately submitted comments to get me your position on this critical question, at least, by the end of next week (Nov 18). This will, I hope, give us a week or so to collate comments to the best degree we can and submit them to Mike.

Thanks for everyone's work on this thus far...

Richard

Richard Whisnant
Assoc. Professor of Public Law and Government
UNC School of Government
Campus Box 3330
Chapel Hill, NC, USA 27599
919.962.9320

From: Bruce Gardner [bgardner@arec.umd.edu]
Sent: Friday, November 18, 2005 3:30 PM
To: Whisnant, Richard
Cc: Brenda Boykin; cmw@ncsu.edu
Subject: RE: Whisnant draft econ feasibility report ver 1

Richard, following are my comments on the draft report.

1. A key statement is on p. 3, where the General Assembly's action in the face of a prediction of a 12% decline in NC swine operations is taken to imply that reductions of 12% "would be 'economically feasible' under the agreement." This is a bold step but I don't have any better idea to offer. There is no strictly economic criterion for this as Dennis said in his note. But doesn't imply that any reduction in swine operations, however small, constitutes economic infeasibility. So there is no alternative to deciding what loss of swine operations does constitute economic infeasibility.

2. With reference to the p. 2 paragraph on defining the industry, I agree that the industry should be taken in a broad sense, to cover pork processing as well as hog production. The question is how far to go in this direction. The key would be what fraction of the related industry's business is tied to hogs. For pork processing it's essentially 100%. For feed it is less. For bank loans and energy it is much less. The question is what constitutes commercial livelihoods being "closely bound up with pork production" (p. 2). For our purposes, I would use your 12% criterion again, and say that if the allied businesses lose less than 12% of their market, bringing them into the picture does not alter the economic feasibility or competitiveness conclusions reached by looking at hog production alone.

3. On p. 9 the draft states: "The real question underlying competitiveness is not the number of hogs, but the profitability (return on investment) for those in the industry." The problem here is the implication that if for example NC lost 90% of its hogs, but the remaining 10% remained profitable, because of the exceptional efficiencies of farms producing them, then we have no competitiveness problem. This can't be right, and what that consideration brings back is the point that we really have to consider the size of the industry as the key indicator of competitiveness.

4. The comments that have been distributed bring in many relevant considerations but I think a main point made in some of them -- that we'll have to end up saying that any outcome in which there is any loss of net income for any NC hog producer or any reduction in NC hog numbers violates the requirement that economic feasibility be maintained -- is insupportable. However, to repeat, Dennis is right to say that we are left with questions of degree, namely what percentage reduction in herd size is the trigger point for economic infeasibility, and that there is no guidance from economic theory on this question. In this context, your approach to the 12% is a worthy effort even if it won't ultimately do the trick (who is to say that a 15% reduction, say, which is within the possible effects of EST adoption, constitutes economic infeasibility).

5. I believe strongly that it would be wrong to say that an EST adoption that had any effect whatsoever in raising costs or reducing net income would be economically infeasible. For many different commodities – broilers, beef, fruit and vegetable products, and non-agricultural products too, as well as in the past history of hogs, there have been and will continue to be many state-specific cost differences, stemming for example from state and local taxes, labor laws, transportation regulation, health/safety regulation. If any long-lasting change that increased one state's cost relative to another's made that state's industry infeasible, we would see far more dying state industries tied to such factors than we do. Variations in these factors may influence the size of the hog/pork industry (and for other commodities too) in some

states relative to others, but we don't have evidence that these factors are the main things determining where in the US our different commodities are produced. So the idea that any rise, however small, in the cost of producing hogs in NC would make hogs economically infeasible in NC, just won't fly. The reaction to our report, if it said that, would be "they've got to be kidding."

6. With respect to the point that the greenfield approach underestimates the costs of some who have big new but non-EST systems, the answer, besides the fact that sunk costs are irrelevant, should be that economic assistance could be provided to producers who could show extraordinary conversion costs.

7. Finally, I would like to note that if we find that the best estimates of cost increases cause herd size reduction of, say 18% while only 12% is acceptable, then we can estimate the subsidy required, say 33% of EST costs, to keep the industry (sufficiently) competitive. [And where cost-benefit analysis comes in is not to over-ride what the Agreement requires, but to help make the call on whether such a subsidy makes sense from the viewpoint of the State as a whole.]

Richard, kudos for all your work on the draft. It is a very clearly written and well argued document.

Bruce Gardner
Professor
Agricultural and Resource Economics
University of Maryland, College Park 20742
301-405-1271

From: Whisnant, Richard [mailto:whisnant@sog.unc.edu]
Sent: Thursday, November 10, 2005 4:32 PM
To: carpentier; reason; bartellis; kerry_smith; joe_rudek; Dave.Townsend; Bundy Lane; Art Rios; Bruce Gardner; Dennis DiPietre
Cc: Brenda Boykin; cmw@ncsu.edu
Subject: Whisnant draft econ feasibility report ver 1

Dear Econ Subcommittee:

I've attached my draft comments on economic feasibility. "Draft" because I am open to changing language that you find problematic if you can convince me why it's wrong. Before noting the core disagreement that exists in the committee, let me point out that there is substantial agreement that (1) the Task 1 work is good and the cost estimates are useful, caveating the concern some of you have about the "greenfields" assumption and also caveating the fact that for "close call" technologies, it is worth considering the degree to which the 10-year working life and the discount rate assumptions drive the estimate; (2) the Wohlgenant model is good and a useful basis for predicting changes in NC herd size from a given incremental cost; and (3) considerations of timing, phasing, and subsidies/financing could be important determinants of "economic feasibility." I have tried to pick up particular language on each of these issues from the comments submitted thus far, and it is as to these things that I am most interested in revisions to my draft that you think are needed before you could agree with the draft.

As you will see, I take issue with the position of Bart, Bundy, Richard and Dennis that, as Dennis put it, "the adoption of an EST which raises the net cost of production in North Carolina is not economically feasible." This is a core issue, of course, in Mike's Technology Determinations, and

I take it as a given, based on the comments submitted thus far, that we will not reach consensus as a committee on this core issue.

I am therefore asking those of you on the subcommittee who have not separately submitted comments to get me your position on this critical question, at least, by the end of next week (Nov 18). This will, I hope, give us a week or so to collate comments to the best degree we can and submit them to Mike.

Thanks for everyone's work on this thus far...

Richard

Richard Whisnant
Assoc. Professor of Public Law and Government
UNC School of Government
Campus Box 3330
Chapel Hill, NC, USA 27599
919.962.9320

DATE: November 16, 2005

TO: Richard Whisnant
Mike Williams

FROM: Art Rios

SUBJECT: Response to "Draft Report to Designee Regarding the Economic Feasibility Determinations"

Dr. Whisnant,

I have read over your draft comments on the economic feasibility determinations and for the most part I am in agreement with them. Therefore, my comments will be short and mainly target areas 2-4 of the draft.

1) Agree. Both perspectives, a financial feasibility and an economic feasibility assessment, are equally important.

2) In determining what entities represent the "hog industry" in North Carolina it appears, based on the different kinds of businesses that will be impacted, that we are moving towards a large scale perhaps regional impact type of economic feasibility analysis. If this is the case, then a full scale social benefit-cost analysis is the best solution for determining economic feasibility because it measures not only the cost of compliance on the businesses within the affected regions but also the potential benefits (air, water, odor, …) of compliance to the region.

   Some the issues raised in the last subcommittee meeting regarding the recent trends of the hog industry in North Carolina along with the industry's current position in the Midwestern states may require a full industry profile which would estimate any projected movements within the industry not related to the North Carolina Agreement. Would the movement of the North Carolina hog industry out of state be due to EST implementation costs or simply due to a comparative disadvantage in North Carolina? If projections show the industry is expanding at a faster rate outside of North Carolina, then the increased costs from EST may simple expedite the closure of economically inefficient farms currently in existence.

   Furthermore, before one assumes a large portion of the industry will move out of state as a result of the installment of ESTs, additional research may be needed to determine which states are projected to benefit. Based on this information it can be determined if there are environmental regulations or anti-corporate farm regulations in place or soon to be in place in the projected beneficiary states that would hinder an expansion of the hog industry within its borders. Would these regulations make it more costly to start up a new operation compared to installing

and operating an EST on an existing North Carolina farm? If this is the case, then the projected flight of the hog industry would be tempered.

3) Generally in agreement here. Sensitivity analysis on the discount rate could provide useful information in determining the feasibility of a technology. Since arguments could be made for both a high and low discount rate depending on whether the discount rate is intended to represent the shadow price of capital or the consumption rate of interest, rates between 3% and 8% could be possible endpoints for the sensitivity analysis.

   In order to avoid bias against a technology with a longer use life, a secondary set of results should be posted which either includes potential returns available from the remaining life years of the equipment or an alternative net present value should be calculated that extends its calculation to the life of the equipment.

4) I agree. A net increase in cost resulting from EST implementation or a decrease in hog production does not necessarily mean the industry would no longer be competitive. As stated, competitiveness refers to the economic viability of the industry. The industry appears to have survived output fluctuations before and maintained its economic competitiveness. If it incurs an X% reduction in hog output in North Carolina but as a whole remains a viable producer in the US, then it maintains its competitiveness and the EST or ESTs being analyzed remain economically feasible. As the Agreement states, (Section III.B.4.c) "The parties understand and agree that alternative technologies that cost more than the lagoon and sprayfield system may be determined to be economically feasible." Under the assumption that a certain percentage of output reduction will be used to determine the economic feasibility of the ESTs, the key component will be setting this threshold. Based on the Agreement and the understanding that a decrease in output does not equal a loss in competitiveness, that threshold must be greater than zero percent.

   I agree that profitability is an important measuring stick for economic feasibility. However, for measuring the long term impact, the number of hogs presents a good proxy for market share gained or lost. If a great deal of market share is projected to be lost to other states to the point that the NC hog industry no longer has the market power for economic viability, then the EST in question would no longer be considered economically feasible. Therefore, both number of hogs and profits should be presented along side each other when determining the feasibility of an EST.

5) Agreed. It appears to make a strong case for considering capital life beyond the 10 years when applicable.

Thank You,

Art Rios
Economist, Innovative Strategies and Economics Group
U.S. EPA/OAQPS/AQSSD/ISEG

Memo

DATE: November 11, 2005

TO: Richard Whisnant

CC: Mike Williams

FROM: Joe Rudek, Environmental Defense

RE: Economic Committee Recommendations Report

I have prepared the following comments for consideration in the preparation of recommendations to the Designee with regard to the definition of "economic feasibility."

The Sensitivity of EST Cost Estimates

Several Committee members have expressed concern about the use of 2004 "greenfield" prices for the cost estimate of the baseline lagoon/sprayfield technology in the comparison to the candidate ESTs. However, since the cost of candidate ESTs is incremental to the cost of the lagoon/sprayfield technology, the use of either greenfield (2004) or the original cost does not affect the EST incremental cost. For example, if the lagoon/sprayfield baseline cost in today's dollars was $100,000 versus $50,000 originally, and the cost of an EST was $200,000, the total costs (baseline + EST) in the 2 cases would be $300,000 and $250,000, respectively. However, in both cases the incremental costs would be $200,000. By using the greenfield price in the Task 1 analysis, the Task 2 competitive analysis did not anticipate the producer paying the additional $50,000 cost differential between the greenfield and original cost estimates, only the $200,000 incremental cost of the EST. As one can see in the Breakdown by Component costs table provided by Zering (excerpted below), the incremental cost estimate does not include any components that would be included in the lagoon/sprayfield cost estimate.

In addition to the baseline cost estimates, there has been much discussion about the sensitivity of the Task 1 EST cost estimates to assumptions regarding the amortization period, the construction cost overhead percentage and the interest rate. Using the Task 1 software model, one can produce EST cost estimates under the varying assumptions regarding these variables. In the table below (Task 1 Model Sensitivity Assessment), the cost estimate produced with the set of assumptions used in the Task 1 Report (10 year amortization period, 43% construction cost overhead and 8% interest rate) are compared to cost estimates produced by using a 15 year amortization rate, a 20% construction overhead and 6% interest. The second set of assumptions yields cost estimates that are 20% to 28% lower than the set of assumptions used by Zering in the Task 1 Report. Preliminary investigations of the Task 1 and Task 2 models indicate that the competitive impacts are proportional to the Task 1 cost estimates. Therefore, if the

Table 4: Breakdown by Component of Candidate Technology Predicted Additional Costs of Retrofit—4,320-Head Feeder-to-Finish Farm with Pit-Recharge System and Nitrogen-Based Land Application onto Forages

	Barham Farm	BEST FAN + TFS	BEST Filtramat + TFS	EKOKAN	ReCip	Super Soils
Manure Evacuation	$1.86	*	*	*	$4.66	*
Manure Evacuation and Lift Station	*	$9.45	$9.45	$7.29	*	$12.02
Strainer	*	*	*	*	*	$0.42
Holding Pond	*	*	*	*	$6.41	*
Equalization / Day Tank	*	*	*	$8.59	$10.38	*
Homogenization Tank	*	*	*	*	*	$27.25
Separation Building	*	*	*	*	*	$19.67
Solids Separator	*	*	*	$20.40	*	$119.87
FAN Feed Tank	*	$6.89	*	*	*	*
FAN Separator	*	$21.14	*	*	*	*
Filtramat Feed Tank	*	*	$17.93	*	*	*
Filtramat Separator	*	*	$40.25	*	*	*
Clarifier	*	*	*	*	$16.52	*
TFS Feed Tank	*	$12.35	$11.15	*	*	*
TFS System	*	$51.47	$53.12	*	*	*
In-Ground Ambient Digester	$53.15	*	*	*	*	*
Flare	$1.23	*	*		*	*
Biofilters	$27.27	*	*	$269.25	*	*
ReCip Cells	*	*	*	*	$85.67	*
Biogreen Module	*	*	*	*	*	$115.43
Clean Water Tank	*	*	*	*	*	$8.36
Phosphorus Removal Module	*	*	*	*	*	$39.71
Electrical Installation	*	*	*	$23.39	*	*
Controls	*	*	*	*	$4.08	*
Start-up Fees	*	*	*	$3.83	*	*
Royalty Fees	*	*	*	*	$8.88	$20.74
Observation Deck	*	*	*	*	*	$4.13
Return to Pits	$5.31	*	*	*	*	$2.04
Land Application (Change from baseline)	$0.35	$13.26	$14.60	$9.51	$6.61	$30.06
Total Per Unit Cost of Technology	**$89.17**	**$114.56**	**$146.50**	**$342.26**	**$143.21**	**$399.71**

** all costs in $ / 1,000 lbs. SSLW / Year **

(page 16, Appendix B.1)

Task 1 Model Sensitivity Assessment

Percent reduction in Barham Farm candidate EST cost estimates in going from set of assumptions including 10-year amortization period, 8% discount rate, and 43.1% overhead rate to set of assumptions including 15-year amortization period, 6% discount rate, and 20% overhead rate

Farm Type	Farm Size (1,000 lbs. SSLW)				
	0-500	500-1000	1000-1500	1500-2000	>2000
Farrow-Wean	25.6%	25.4%	24.6%	23.9%	22.4%
Farrow-Feeder	-[1]	25.2%	23.6%	22.5%	21.0%
Farrow-Finish	25.3%	23.1%	21.7%	21.3%	19.8%
Wean-Feeder	28.1%	22.9%			
Feeder-Finish	24.2%	23.1%	21.7%	21.3%	20.4%

Source: Predicted Cost Calculator v.3.0-1.xls (Task 1 Software Model)

Note:

1. For unknown reasons, the model produces no estimate for Farrow-Feeder 0-500 size farms under the set of assumptions including a 15-year amortization period.

Task 1 cost estimates overstate the actual costs by 20 to 28%, the Task 2 competitive impact analysis will also overstate the competitive impacts by 20 to 28%. The sensitivity of the cost estimates and therefore competitive impacts to the economic variables used, drives home the point that the model outputs are best viewed as general trends.

Ability of the Industry to Offset Costs

The general finding that increased cost of production will put a downward pressure on quantity of production and that isolating that increased cost to a region will accentuate that impact, may seem to be intuitive. However, in a real life example, PSF in Missouri has experienced increased costs resulting from higher environmental compliance without the collapse of the industry in that state. Apparently this was accomplished by finding savings in other areas to offset the increased compliance costs. There is no a priori reason to suggest that there was much more "fat" in the production costs in Missouri that made such cost offsets easier than they would be in NC. Data from PSF on the higher compliance costs in Missouri and how these were offset would be instructive to this committee as it considers its recommendations.

The Definition of Economic Feasibility

The committee discussions on economic feasibility have focused on the question of what percentage reduction in market quantity the North Carolina pork industry can sustain and still remain competitive. While the Agreement does acknowledge that ESTs may cost more than the lagoon/sprayfield system, as has been pointed out, it does not address whether or not some farms may close or herd size might decrease. There is no basis upon which to infer the intent of the Agreement with regard to what an acceptable level of market quantity reduction might be (zero, 10%, 20% or any other quantity). The notion that the closure of a single otherwise profitable farm, because of the added cost of an EST, renders the NC pork industry noncompetitive is not well founded. By this logic, a feed increase that causes one otherwise profitable farm to close would render the entire NC industry as noncompetitive. Some farms may close and the herd size might decrease, yet the NC pork industry could still remain competitive. The question is how much might the herd size be reduced before the NC industry is not competitive?

From various economists I have heard expressed the basic principle that the cost to improve environmental performance of an industry should at least be equal to the benefits provided to society, to be worthy of consideration. While this does not necessarily indicate what portion of that cost the industry should pay, it does provide a threshold for the level of costs that are supportable by whatever combination of resources are eventually applied to achieve the improved environmental performance. Such an evaluation is a step forward in that it provides a first cut in reducing the universe of technologies under consideration. From the analyses I provided to the Committee at our September 23rd meeting (Construction Cost = Social Benefits**)**, I estimated that the social

benefit could support an EST construction cost of as much as $400,000 (for the "average" farm of 4320 head). The Task 2 model output for ReCip, which has a construction cost of $435,000 (for the "average" farm of 4320 head), can be used to estimate the market reduction impact of a construction cost approximately equaling the benefits estimation. The average of the 3 largest size categories in each animal life stages (from the industry categorization scheme used in the economic analysis), produces an estimate of a little more than 20% market quantity reduction. (Using the largest categories of farms provides a weighting to account for the fact that 75% of the hog population in NC is housed on the 640 largest farms [see page 34 – 37 of Appendix B.1].) Therefore, based upon the basic benefit/cost principle, a 20% reduction in market quantity is supportable. Given that, the question is then what portion of that should be paid by industry? Without other parameters to measure the effects on the competitiveness of the North Carolina industry, I propose that the industry pay half of the cost indicated in the analysis of the costs supported by benefits to society. In other words, I propose that a 10% market quantity reduction or a construction cost of the equivalent of $200,000 per 4320-head operation, should be considered economically feasible.

Conversion Schedule

Another important consideration that should be included in this committee's recommendations is the timing of conversion. How can the economics of the "right" schedule of conversion be assessed? Clearly, learning by doing is important and lessons learned should be applied as soon as possible to upcoming installations. Phasing EST introduction will help avoid unseen design flaws in first generation technologies, avoid problems with the availability of design and construction resources, and allow for the growth of value-added markets to ensure that supply (from EST implementation) does not exceed demand.

Considering the distribution of the industry, it seems to make sense to focus on conversion of the 640 largest operations representing approximately 75% of the hog population. I suggest that 60 operations be converted in the first year, 80 in the second and 100 farms per year for next 5 years. This schedule would provide for the conversion of 75% of the industry in 7 years. The remaining smaller farms (approximately 1400 farms) representing 25% of the hog population, could be converted in the following 3 to 4 years, resulting in an approximate 10 – 11 year conversion schedule.

DATE: November 22, 2005

TO: Richard Whisnant

FROM: Joe Rudek, Environmental Defense

SUBJECT: Response to "Draft Report to Designee Regarding the Economic Feasibility Determinations

Dr. Whisnant'

Thank you for preparing the draft report for the Economic Committee's consideration. I generally agree with your draft recommendations. I have prepared a separate document reflecting my thoughts on the Economic Committee recommendations which I am also sending to you (titled: Economic Committee Recommendations Report", November 22, 2005.) Many of the recommendations included in that document are in line with those contained in your Draft Recommendations (of November 16, 2005.) However, I do have a few suggested amendments and additions to your draft which are detailed below.

Most importantly, let me state that I agree with your proposed definition of "economically feasible" (i.e. 12% market quantity reduction as predicted by the Task 2 model). I arrived at a similar number from a different perspective, that of the benefit/cost estimations, in my comments. I believe the previous decisions and experiences associated with the .0200 rules in North Carolina provide a strong basis to support the economic feasibility recommendations of this committee.

I have a few comments directed at specific sections of your draft which I will address below.

Page 6, last paragraph of Section 3 (and related text on page 10): I believe the comments associated with "greenfield" lagoon costs versus actual cost experienced in the past during installation are without basis. As the candidate EST cost estimates are incremental to the lagoon/sprayfield costs, the baseline technology cost estimate does not affect the candidate EST cost. See my separate comments for more detail. I recommend that this paragraph be deleted.

Page 6 - 7, first paragraph of Section 4: The main point of this paragraph seems sound and contains information that is valuable to the discussion at hand. However, my understanding of the Task 2 model is that it accounts for cost differences across all farms. Therefore, describing the modeling as based upon average costs is not accurate. I recommend that the word "actual" be deleted from the first sentence; and the second sentence be deleted and replaced by something like, " The Task 2 model accounts for the production cost variances across farm categories."

Page 7, second paragraph of Section 4 (and related paragraphs on page 11 under Time Frame section): It is my understanding that the concept of net present value is

inappropriate for the Task 1 and 2 models. The cost of technologies installed in the future will not be cheaper than they are today but as expensive, if not more expensive. With no other factors considered, one might expect the EST costs to at least rise proportionally with the other farm related costs in the future, maintaining the same market quantity impact. However, the affects of "learning by doing" and second generation (and beyond) improvements in the ESTs can be expected to bring down the costs and the associated impacts to market quantity. This is a more appropriate rationale for the value of phasing the conversion to ESTs. I recommend deleting the text associated with net present value and replacing it with a discussion of expected cost reductions through EST improvements.

I have suggested a 10 year schedule for conversion in my comments which focuses on conversion of the largest 640 operations (in the first 7 years), representing more than 75% of the SSLW in the North Carolina industry. (See my comments for more detailed description.) I recommend that my suggested schedule be included in the recommendations to the Designee.

Page 10 – 11, Phasing Section: I don't follow the logic of the discussion on converting the impacts on company farms to the entire herd. Followed to its extreme, this treatment of market quantity reductions could support almost any conversion price if the segment of industry targeted were small enough. It would seem far more straightforward to set the economic feasibility criteria in terms of cost instead of percent market quantity reduction, based on the relationship between predicted market quantity reduction on the whole herd and the associated cost estimates. If affects on company farms are estimated to be higher, perhaps the company farms most able to absorb conversion costs could be prioritized for conversion, although how such an analysis would be undertaken is not at all clear. Once an initial set of pilot testing is underway, cost reductions as described above, as a result of learning by doing, have historically brought the costs of new technologies down. In fact, EPA has developed formulas to estimate these expected cost reductions. Such cost reductions will serve to lessen the impacts on subsequent farms and the industry in general.

M E M O R A N D U M

July 7, 2005

To: Richard Whisnant, Chair for Economics Subcommittee

From: Kerry Smith

Subject: Response to Chair's Framing Memo

The purpose of this memo is to respond to your request for reactions to the proposed structure for our discussion. Before getting into details, thank you for making our task easier with your effort to organize the questions that can focus our discussion. I know everyone on the subcommittee appreciates them. My comments react to your questions and suggestions, integrating some parts of formal comments I submitted to Dr. Williams on July 13, 2004. I have only extracted the parts that are relevant to our charge. I repeated two of your questions where I have comments. My reactions to question #2 relate to your questions #3 and #4 so I didn't repeat that material. After some discussion of issues with the information at our disposal, I close with a few comments on what these comments imply for responding to our overall task.

1. How to compare the projected incremental, annualized retrofit costs for each technology with the calculated cost of a lagoon and sprayfield system?

There are several issues associated with comparing the incremental annualized retrofit costs of each technology. I have described two of them to provide support for your selection of option [b]. They are: the selection of a definition for baseline conditions and the annualization of capital costs.

A. Baseline Conditions

There are different concepts of baseline implied by the Agreement and Dr. Wohlgenant's model.

Agreement's implicit baseline

The Agreement calls for measuring the 10 year annualized estimate of costs per 1000 pounds of steady state live weight for a lagoon spray field system meeting current regulations. This is to be available for comparison to the costs of augmenting existing farms with the technologies judged to be environmentally superior.

Dr. Wohlgenant's model baseline

This model's baseline is somewhat different from the Agreement's specification. In the model there are two baselines – the reference point in measuring the cost increment that is attributed to each technology and the baseline price. The first of these baseline conditions is not the cost of production with a new lagoon and sprayfield system. As I understand the structure, the analysis develops a set of reference costs that allow the results to be adapted from the demonstration farms so they can be used to develop estimates of the cost increments for the 21 size/type categories of farms. To understand why these two other aspects of baseline conditions are important one needs to consider how the model is structured. The model relies on a simple but well respected logic to evaluate the effects of mandating each new technology. I believe it is possible to summarize the logic of the model using three basic tasks:

(1) Develop estimates of the annual increment to costs (capital and operating) due to each technology for each of the size/types of farms. In the case of the Wohlgenant model, there are 21 size/types (a decomposition of farms in the NC component of the industry is required by the Agreement. This was presumably required because the types of activities, sale and waste generation at each type would be different. Such heterogeneity might influence the performance (and cost) of new waste management technologies).

(2) Measure these cost additions as a percent of a baseline price for each type of hog related output affected directly by a technology in the model.

(3) Measure for each product type a supply response to changes in prices. These are what Professor Wohlgenant referred to as elasticities. They describe the percentage change in the amount of the product available (for example, one type is finished pigs) for a percentage change in price. Thus, if this supply elasticity is 2.0 then a 10 percent increase in the price of a product will increase available supply by 20 percent. In this context, the price increase must be associated with money received by the producer.

The model's logic treats the cost of a new technology intended to control some aspect of the emissions from hog operations as something that would be required in NC to be a hog producer. Except in so far as the Zering team incorporated adjustments to their cost, the technologies are assumed to make no contribution to the activities associated with producing hogs (each technology is regarded as a necessary cost to reduce emissions). This specification implies the estimated unit costs (per thousand pounds live weight) for a technology (with adjustments for byproduct revenues if relevant) are subtracted from the price a producer would receive on each size/type category of farm. That is, the net price available to pay for production costs and compensate effort is lower (see his equations on bottom of page 45 and VA1 on page 46 in the June 2004 draft report).

The cost estimates are derived from the analysis of the Dr. Zering team (with Drs. Chvosta and Norwood and Mr. Adkins). The logic of the Zering team's methodology is to estimate what might be termed net incremental costs of the new technologies (the 4b(i) incremental cost) to meet the needs of Professor Wohlgenant's model. They take account of both the savings because some activities would not be needed and the new costs specific to each technology. These adjustments are equivalent to defining a set of baseline conditions underlying the cost estimates. They are different than those I have argued are implied by item 4b(ii). Moreover, the estimates of the Dr. Zering team are not

estimates of the actual incremental costs of the technologies at the existing farms. If I understand the logic they have been adapted to adjust for the special circumstances at each application site and matched to what might be expected for the 21 size/types.

Thus, a technology for dealing with the waste that adds unit costs (estimated by Professor Zering's team) of *K*, implies the net price available to cover production costs and to compensate effort is lower by *K*. The proportionate reduction is then K/P_0, with P_0 the baseline price. So if this ratio is 0.08, it means net price available to producers declines by 8%. If we continue to assume (as an example) that the supply elasticity is 2.0, the quantity supplied declines by 16% for this product type.

The Agreement lists estimates 4b(i) and 4b(ii) as considerations to be compared by the designee in evaluating the feasibility of the new technologies. This request in the Agreement appears to call for what might be described as a "greenfield" comparison. That is, if each farm within the NC industry were new. The agreement requests considering the environmental superior technology versus the lagoon and sprayfield system designed, constructed, and operated under NRCS mandates. We do not have these data.

This is not what the model evaluates. The model attempts to gauge what *would happen* with each technology introduced on each of the 21 farm size/type units for all the existing farms in NC (based on the June 2004 analysis). Thus a key issue is the adaptation of incremental costs from the demonstration farms to the size/type categories for existing farms.

In summary, baseline conditions are different in at least three components of the ways we are to address your first question.

- There is a baseline assumption specific to the agreements comparison of 4b(i) and 4b(ii).
- There is a different baseline assumption used in linking the cost experience at the farms where technologies have been evaluated to the farm types required for the Wohlgenant model.
- There is a baseline assumption associated with the price used to define the size of the displacement due to the costs of the technologies.

B. Working Life, Annualization, and Time Horizon

The Agreement requires consideration of the 10 year annualized costs of a new lagoon/spray field and of the added technologies. The capital costs are very important components of the unit cost effects. The assumption that 10 years is the default working life for the capital equipment is not necessarily warranted. It will vary with equipment and thus each technology. I believe an argument can be made for drawing a distinction between planning horizon and time period of annualization. The time period for annualization is the life of the equipment (not for tax purposes – but a best estimate considering maintenance practices). Under this view, the Agreement's specification of the 10 year time horizon would be interpreted as a planning horizon – not a working life.

On this point, Professor Wohlgenant and I disagree. I should be clear that this is not a dispute over what is "correct" from the perspective of economic modeling. Rather, each of our positions represents different interpretations of the Agreement. The incremental costs have variable and capital cost components. In most of the technologies evaluated, the annualized capital cost is a large component of these incremental costs.

Many factors influence these estimates. Adjustments had to be made to the results for demonstration farms to develop these estimates. These are documented in the reports for each technology, and I am not qualified to evaluate them.

My comments relate to two generic issues – the working life assumed for the equipment associated with each technology and the discount rate. Conventional practice uses an annualization adjustment or capital recovery factor (CRF) to develop estimates of the annual costs attributed to expenditures on durable capital equipment. With capital expenditures made today, assumed to last *n* years, the expression defining the CRF is given as follows:

$$CRF = \left[r \cdot (1+r)^n\right] / \left[(1+r)^n - 1\right]$$

r = the pre-tax rate of return (or the discount rate)

Annual capital costs (ACC) are estimated by multiplying the CRF times the capital expenditures (CE) made today (e.g., ACC = CRF · CE). The table below illustrates how each factor influences the outcome

Discount Rate	Working Life	CFR
.05	5	.2310
.05	10	.1295
.05	15	.0963
.05	25	.0709
.08	5	.2505
.08	10	.1490
.08	15	.1168
.08	25	.0937
.10	5	.2638
.10	10	.1627
.10	15	.1315
.10	25	.1102

Lower discount rates reduce the annualized capital expenditures (for a given working life) and longer working lives reduce the annualized capital costs.

It is unrealistic to expect a detailed treatment of the working lives of each component of the capital equipment for each technology. This task is beyond the scope of the Wohlgenant/Zering analysis. Nonetheless, we do need to recognize that these assumptions are potentially quite influential to what might be the largest share of the incremental costs for several of the technologies.[1]

[1] Professor Zering also highlighted the overhead rate for installation or construction as another important consideration in estimating the capital costs.

If we treat the 10 year annualization called for in the Agreement as a planning horizon, then the decision on the working life is a separate consideration. This is important because I believe that several panelists suggested the lagoon/spray field system had an "*infinite*" working life. With proper maintenance they seemed to be suggesting the systems would last for the foreseeable future.

This is not so for the other technologies and, in my opinion, should be explicitly considered. Professor Wohlgenant regards a change in the 10 year working life as imprudent.[2] I am not sure and believe this is an issue that would benefit from further discussion.[3] EPA's regulatory impact analysis for air related regulations used 15 years as the working life and a range of discount rates.[4] Jorgenson and Yu [2001] report estimates for economic lives of business assets ranging from 8 years for construction tractors (9 for farm tractors) to 54 years for railroad structures. Professor Wohlgenant cited the Alston et al. [1995, pp 358 – 359] book for discussion of the "one-hoss-shay" depreciation model (e.g., the technology continues to make contributions, in this case to removing residuals at the same rate, until the end of its working life when it "instantly" becomes worthless). I agree this format seems reasonable, but it does not change the need to consider the impact of assumptions about discount rates and working or economic lives.

Based on these two considerations alone, I believe that we need to adopt your option (b) and then consider the supplementary information needed to develop comparisons.

2. How to assess "the impact that the adoption of alternative technologies may have on the competitiveness of the North Carolina pork industry as compared to the pork industry in other states."?

In my opinion, the term "competitiveness" in factor 4b(v) does not imply we are to assume perfect competition in the market for pork. Rather it relates to an evaluation of the effects of recommendations for adoption of specific technologies considering their impact on the "economic viability" of the NC pork industry as compared to other states. A simple Oxford dictionary definition for the word "viable" describes it as meaning "capable of working successfully" and in biological uses as "capable of surviving or living successfully." This term seems to me to be more consistent with the intent of the

---

[2] Professor Wohlgenant's position is that there are a number of complexities we are assuming away in the analysis of these new technologies. Quoting from his comments on an earlier draft of my 7/13/04 comments to Dr. Williams:

> "From an economic point of view, the likelihood the technology will become obsolete has to be factored in as well as risk of implementing the technology. I think it is fair to say that it is impossible to quantify the degree of uncertainty of economic life. You say you think 10 years is too short. Someone else might argue 2 years is too long with the rapid development of new technologies that is likely to occur. In light of this the only possible solution is to abide by the agreement of assuming a 10 year economic life. Any other estimate is purely speculative and cannot be justified."

I agree with his concerns about these uncertainties. I still feel that the subcommittee should consider whether 10 years <u>as the working or economic life</u> for the equipment (for all technologies) and 8% (in real terms) as the discount rate are the exclusive assumptions used in comparing all technologies.

[3] My position is not that a single new working life be adopted, but that we all recognize judgments about economic feasibility are impacted by the working life and discount rate assumptions in addition to the performance of the technologies and associated estimates of other aspects of their incremental costs.

[4] U.S. Environmental Protection Agency [1999].

Agreement. Of course, it does not lead to a standard for a quantitative assessment of how much control and associated compliance costs can be "tolerated" by the NC pork industry.

It may be helpful in evaluating my recommendation that we consider alternative strategies for evaluating this part of the Agreement to see how other regulatory analyses define competitiveness. Consider, for example, what is given in EPA's Guidelines for Preparing Economic Analyses (2000). In describing how to evaluate the impacts of their regulations on private firms to reduce pollution, this document draws a distinction between Impacts on Profitability and Plant Closures versus impacts on Industry Competitiveness. The former is described in terms of answers to three questions:

> "Do the costs of the regulation result in a negative discounted after-tax cash flow?
> Does the facility or firm's profitability fall below acceptable levels?
> Is the facility or firm's ability to finance its operations and pay its obligations jeopardized?" (EPA [2000] p. 154)

The first question is qualified in a footnote suggesting that if after-tax cash flow is negative under baseline conditions (prior to the regulation that leads to compliance costs) then the facility is a likely candidate for closure regardless of the regulation and any closures or impacts shouldn't be attributed to the regulation.

By contrast, this guidance document calls for analysis of competitiveness in terms of two quite different questions:

> "Will the regulation erect entry barriers that might reduce innovation by impeding new entrants into the market?
> Will the regulation tend to create or enhance market power and reduce economic efficiency of the market?" (EPA [2000] p. 156)

These questions imply that regulations enhance industry profitability by creating barriers to entry. I do not feel this is what the Agreement implied in the language requesting an analysis of the competitiveness of the NC industry compared to other states.

If we turn to the profitability and plant closure standard, the EPA proposal for analysis implies a focus on individual facilities. It would imply using something like the Wohlgenant model in an iterative fashion to evaluate how different potential policy mandates for the environmentally superior technologies affected different types of farms. Since many of these individual farms are owned by larger firms – farm-by-farm profitability assessments do not seem to offer much insight on "viability." If the subcommittee also feels that viability is the standard, then we need to consider what can be learned from the Wohlgenant model and how it is to be used in assessing viability as the intent of the competitiveness standard. This conclusion implies the subcommittee needs to evaluate whether the model's outputs can be used in this way. I have summarized below my reactions to this question.

The model is driven by cost increments and assumed baseline conditions. The baseline prices used to compute the percentage increment due to each technology are important. The model represents aggregate (across farms) behavior. Thus, the quantity response in each size/type category is the result of adjustments made by all the farms that are in that category. The model cannot estimate how many farms would close in response to the cost increases implied by the use of a particular technology. However, if the output that is coming from a size/type group declines to zero as a result of the

increases in unit costs then this result necessarily implies the specific farms that accounted for that output are doing something else. The methodology is a well-established one in the literature.[5] Demand and supply functions are estimated from market data and the measures of quantity responsiveness to factors influencing prices (i.e., the elasticities) provide the basis for estimating how the market responds. The model is more sophisticated than many of the past applications of this methodology. It allows for the adjustment to a cost shock to take time so the full response with complete adjustment will be different than the one that the model implies would be observed immediately after the cost increase. The supply functions assume that the industry is either competitive or that there is a constant relationship between price and marginal cost (see pp. 36-38).

The model assumes price taking behavior. Under these circumstances to the extent exogenous sources of cost increases lead to increases in average costs, farms with higher unit costs must adapt. This adjustment is implicit in the output adjustment. What must be taken as a maintained assumption is that the price/marginal cost relationship implicit in the estimated supply response (and captured in the measured price/output slope coefficient) does not change from historical patterns.

What does this imply?

(1) For a product type, supply responses will be a function of the associated supply elasticities and the relevant K/P_0 ratio. The model estimates that all size groups will have the same supply slopes. With linear supply functions the elasticities (percentage change in quantity due to a percentage change in price--which can be described as the product of the slope ($\Delta Q/\Delta P$) times the price quantity ratio (P/Q)) will vary across farm type/size groups as the (P/Q) ratios vary in the baseline.[6]

(2) Professor Zering's estimated unit costs of new waste control technology and the assumed baseline conditions will be important to estimated effects. For example, what are the unit costs per 1000 pounds steady state live weight for each product type and size group? The Wohlgenant/Zering analysis does not have unit cost estimates for any type/size group for farms under current operating conditions. It is my understanding that these data are viewed as confidential by the firms. Nonetheless, one way to evaluate the baseline prices is to compare them to unit cost estimates for current operating conditions that are derived outside the Wohlgenant/Zering analysis. My rationale for this suggestion is very simple. A baseline price is assumed to reflect "normal" conditions. With the moratorium and a host of other influences on the market for meat products I am not sure what are normal conditions. The simplest model of a perfectly competitive set of conditions for firms would suggest that with no incentives to enter or leave the industry we might expect that (for the marginal firm) price = marginal cost =average

[5] Alston, Norton and Pardey [1995] suggest it originates with a paper by Muth [1964]. Professor Wohlgenant has been a leading contributor to this line of research.

[6] Professor Wohlgenant tested for differences in slopes and could not reject the hypothesis that they are equal.

> cost.[7] Comparison of the baseline price assumed with an estimate for unit costs might give a simple gauge of the circumstances used to define the baseline. These data would need to be developed from other sources. The Wohlgenant analysis uses only a set of baseline prices and the estimates of added costs of each technology. Thus the Wohlgenant–Zering empirical analysis does not need to estimate current unit costs. It evaluates the set of incremental activities and their associated costs (or cost savings) based on the demonstration farms' performance records with the specific technologies installed on them.

Developing independent unit cost estimates might help in judging the relevance of the assumptions about the baseline prices.

In reacting to my earlier comments (7/13/04), Professor Wohlgenant raised a key concern with efforts to consider the level of the baseline price. The analysis underlying the displacement model is inherently a "local" evaluation. This characterization means it considers a displacement from the baseline equilibrium (i.e., an initial set of conditions assumed to represent an industry equilibrium) as a proportionate change that shifts demand and supply functions. Elasticities are computed for the actual conditions observed. Selecting a baseline value substantially outside "normal" existing operating conditions would not be consistent with what is observed and thus misrepresents the potential effects. I agree. My point is that the effect of each technology is conveyed to the market model with a ratio:

$$\frac{\text{incremental cost of the technology to a type/size farm}}{\text{relevant baseline price}}$$

The numerator comes from the Zering team's analysis. The denominator is selected to represent the baseline conditions. The model responds to these ratios for the type/size groupings of farms. Changes in either numerator or denominator will change the primary way the effects of the technologies are conveyed to the model.

Bottom Line – the answer to this question is also related to your 3 and 4. The Wohlgenant model implies changes in the number of farms, types, timing, will influence the size of the impact on the NC component of the pork industry.

How should we decide? In the absence of developing a full benefit cost analysis – where the gains to households would be measured from reduced emissions would be counted along with the compliance costs from meeting specified technology mandates, from a social perspective there is no "ideal" size for the NC pork industry or any other industry. One can describe impacts on outputs and employment from changes in components of the NC pork industry. Moreover, one could do the same thing for other

[7] To the extent firms are different, with differences related to quasi-fixed inputs like capital (or particular skills), we can expect this condition would apply to the marginal firm or the one earning zero economic profits. See Panzar and Willig [1978] for an early discussion of this concept. It would not be reasonable to expect one could isolate a "marginal" firm (or farm) in the context of Professor Wohlgenant's model because individual firms (or farms) are not specifically identified. The model defines type/size groups that are aggregates of farms in each category. Thus, for practical purposes a unit cost by category may be the best one could hope for.

industries. For example, if the pork industry grows and increases employment with indirect effects on other aspects of the NC economy it is also possible that the emissions it produces will have unintended negative effects on another industry in NC. Some time ago, Mansfield and I [2002] used a commercial software product called Implan to make this type of comparison for components of the hog industry in North Carolina in comparison to sectors we identified with coastal tourism in NC – the results at that time are given as follows:

NC Hog Industry	Output Multiplier	Employment Multiplier
Hog farms	1.86	2.20
Meat packing	1.79	5.57
Sausage products	2.05	3.47
Coastal Tourism	2.56	1.79

For each dollar spent on each component of the NC Hog Industry these indicate the added dollars "generated" as a result. Similarly for jobs. For comparison we considered Coastal Tourism and this sector might gain from reductions in the NC Hog Industry.[8] The former (hogs) has a much larger employment effect (depending on what you include) and the latter has a larger output effect.

Perspectives and Next Steps

Conventional practice in evaluations of these choices for federal regulations constructs information for use by policy makers that is usually of three types:

(1) Information about the expected performance of the regulations in meeting specific objectives that are defined by the legislation that is the source of the rules; for example, "protecting human health with an adequate margin of safety" is interpreted as protecting the average member of the "most" sensitive group to the pollutant to be regulated. Performance is judged in this case by the health risks to this group before and after the regulation.

(2) A benefit-cost analysis of the net efficiency effects of the regulation – comparing all the sources of economic benefits and economic costs that have quantifiable outcomes(usually in monetary terms) .[9]

(3) Impact analysis – these include the profitability and plant closure measures, as well as impact evaluation similar to my example of impacts of pork industry versus coastal tourism.

Item (2) was added as a result of President Executive Orders (12291 and 12866) and item (3) is usually there because the mandate associated with many environmental regulations usually has a phrase referring to "economically achievable."

Overall then, at best we can describe consequences of policies; outline how they can be mitigated; but there is no escaping the conclusion that the adoption of new waste

[8] It is important to underscore that such analyses usually ignore adjustment processes and assume full employment of resources.

[9] One would not want to decide based on a mechanical application of benefit-cost analysis. Right now the Agreement specifies goals (i.e. substantially eliminate most emissions, see II C 1-5 of the agreement) and presumes there is a series of possible technological fixes. There is no way to judge how much waste control is socially warranted. The benefit analysis offers a rough judgment for use in an ultimate policy evaluation.

control technologies will impose costs and thus influence the size of the hog industry in NC. I suggest that we consider the problem in terms of the scale of the compliance costs imposed on the NC Pork Industry over time *and* the need to create incentive based policies. The latter would imply defining what we want to see realized in terms of emission reductions for each type of pollutant each year within a specified planning horizon, based on what would happen if specific technologies were adopted. Then the my suggestion for the process would be to create "pollution permits" from a defined starting point for emissions of each pollutant such that the reductions would be realized thru the total amount of permits allowed for each pollutant. The important point is that the permits could be traded. They would need to be dated so the lower levels of annual emissions each year were realized. Endow firms with stocks of permits consistent with their each year's goal. They could adopt the technology required (and identified through our process) or buy permits from others who were able to do more than what was required of them. This process creates continuous incentives to do better. It also suggests that the costs and impacts for whatever we decide as "achievable reductions" without affecting the viability of the NC pork industry will be upper bounds. The incentive based policy creates mechanisms to assure firms are rewarded for doing better than this. Hence actual realized costs are likely to be lower.

What should the near-term goals be? It seems to me we need to compare the effects of various implementation plans for the technologies (and the associated permit levels) to the historical movements in prices and production in the NC Pork Industry as well as other states. This process might lead to guidance for near-term goals and would specify the long-term targets in terms of emission reductions.

As I finish this set of comments – this process all sounds complicated. Right now we have two extreme positions:

- "substantially eliminate" all of the Agreement's specified contaminants
- any reduction in herd size due to mandated requirements for reductions in pollutants represents an infeasible outcome.

Our task is to use the information from the scientific, engineering, and economic analyses to narrow this wide discrepancy in perspectives about the reductions in pollutants from hog farms that are feasible. I think we can do that using the models as guides. We will need multiple runs under different assumptions –but presumably that can be done. I have suggested adding another feature -- an incentive structure that assures that those who find ways to do better than the mandated technologies are rewarded at each stage of the process. This addition will imply whatever we pick as a feasible goal will have actual private economic costs and impact that are smaller than what we now estimate as their effects.

REFERENCES

Alston, Julian M., George W. Norton, and Philip G. Pardey, 1995, *Science Under Scarcity* (Ithaca: Cornell University Press).

Muth, R. F., 1964, "The Derived Demand Curve for a Productive Factor and the Industry Supply Curve", *Oxford Economics Papers*, Vol. 16 (July) 221-234.

Jorgenson, Dale W. and Kun-Young Yun, 2001, *Investment Volume 3 – Lifting the Burden: Tax Reform, The Cost of Capital and U.S. Economic Growth* (Cambridge: MIT Press) (Chapter 1).

Mansfield, Carol and V. Kerry Smith, 2002, "Tradeoff at the Trough: TMDLs and the Evolving Status of US Water Quality Policy," in J.A. List and A. de Zeeuw editors *Recent Advances in Environmental Economics* (Cheltenham, UK: Edward Elgar).

Panzar, John C. and Robert D. Willig, 1978, "On the Comparative Statics of a Competitive Industry with Inframarginal Firms", *American Economic Review*, Vol. 68 (June) 474-478.

U.S. Environmental Protection Agency, 1999, *The Benefits and Costs of the Clean Air Act 1990 to 2010, Report to Congress*, November.

U.S. Environmental Protection Agency, 2000, *Guidelines for Preparing Economic Analyses* (U.S. Environmental Protection Agency September) EPA 240-R-00-003.

Appendix D: Economics Subcommittee Reports

Minority Report

MEMORANDUM

To: Mike Williams

From: Bart Ellis; Smithfield Foods, Inc.
Dave Townsend; Premium Standard Farms
Bundy Lane; Frontline Farmers
Richard Eason; President, Cape Fear Farm Credit
Dennis Dipietre; Economic Advisor, Premium Standard Farms

Subject: Economics Subcommittee Members (above names) Recommendations

Date: December 2, 2005

I. Introduction

This report responds to Dr. Williams' June 28, 2005 request for the Panel's recommendations relative to the economic feasibility or "B" factors in the agreements between the Attorney General of North Carolina and Smithfield Foods and Premium Standard Farms (collectively, the Agreements"). Specifically, Dr. Williams asked this Panel for its recommendations regarding (1) whether there are any valid reasons why the information in the Task 1 and Task 2 documents should not be considered by the Designee in making his Technology Determinations under the Agreements, (2) how the projected 10-year annualized cost metric projected by the Task 1 study results for the technologies that meet the environmental performance standards or "A" factors should be compared to the projected 10-year annualized cost metric projected by the Task 1 study results for the existing lagoon and sprayfield system, and (3) how the schedule for the implementation of Environmentally Superior Technologies ("ESTs") should affect the interpretation of economic feasibility as described in the "B" factors. A related question also asked for the Subcommittee's views regarding how the projected quantitative impacts of adopting ESTs on the quantity of swine should be considered in determinations of economic feasibility.

II. The Economic Feasibility or "B" Factors

Given the tasks assigned to this panel, it is important to first discuss the proper scope and application of the economic feasibility factors at Subsection III.B.4 of the Agreements.[1] In other words, what do the Agreements mean when they say that a technology must be determined to be "economically feasible" before it can be declared an EST?

While it may be stating the obvious, we begin by pointing out that the Agreements set forth the information and factors to be used in determining economic feasibility, and it is this information and these factors that the Designee must use in making his determinations. Some have suggested that the Designee depart from the Agreements and use cost-benefit or other factors because they have been used to adopt technology-based standards in other settings such as EPA's rules establishing regulations and standards. While it may have been appropriate to use these other factors for other purposes, they are not in the Agreements, and, therefore, can not be used here. This is not a rulemaking or regulatory proceeding, but an agreed upon process where the parties to the Agreements established their own rules governing determinations of economic feasibility. Therefore, we are bound by the wishes of the parties and these wishes must control regardless of the preferences or views of others.

It is our belief that the Agreements, while cumbersome at times, are well-conceived documents which have at their hearts two main objectives: first, to seek alternative waste management systems for North Carolina swine operations which will be substantially improved from an environmental protection perspective; and second, to maintain the viability of the same North Carolina swine operations from a fiscal perspective.

The parties to the Agreements knew that they were establishing a process that would seek only to identify new technologies for North Carolina swine operations. Therefore, the Agreements are not and cannot be empowered to affect waste management changes on swine operations outside of North Carolina. This reality is the rationale behind the Agreements' emphasis on maintaining the North Carolina swine industry's economic competitiveness in the event that it, and it alone, must bear the added expense of a new waste management technology. The Agreements clearly contemplate the potential for a new technology cost structure which would be greater than the cost structure of the current technology, and that this cost differential has the potential to place the North Carolina swine industry into a noncompetitive fiscal position. Ideally, an EST costing more than the current system would produce byproducts (energy, fertilizer, ash, etc.) which would offset the added capital and operating costs incurred by its adoption.

With the above as background, we turn to the specific language of the Agreements.

Section II.C of the Agreements provides that a technology or combination of technologies can be found to be an Environmentally Superior Technology ("EST") only if it has been determined, among other things, to be "economically feasible." Paragraph

[1] The Smithfield and Premium Standard agreements contain identical provisions related to economic feasibility. The section references in this report are to the Smithfield agreement.

III.B.4.b of the Agreements, in turn, lists five "factors" that the Designee will consider in determining whether a particular alternative technology is economically feasible for a category of farms. Therefore, the controlling economic feasibility factors are those listed in paragraph III.B.4.b. Of these five factors, only the fifth factor at subparagraph III.B.4.b (v) is expressed as a criterion or standard that can be used to make economic feasibility determinations. The first four factors listed at subparagraphs III.B.4.b (i)-(iv) are really not factors at all because they do not contain any criteria or standards against which to judge economic feasibility. Rather, these four "factors" simply identify the information that must be compiled and analyzed to determine whether a particular alternative technology meets the fifth factor, which is

> *the impact that the adoption of alternative technologies may have on the competitiveness of the North Carolina pork industry as compared to the pork industry in other states.*

This subparagraph reflects the intent of the parties to the Agreements that the continued competitiveness of the North Carolina pork industry would be the controlling factor in determining whether a particular alternative technology is economically feasible. This is because the Agreements apply only to hog farms in North Carolina, and the parties recognized that these farms would not be able to compete with hog farms in other states if the added cost of the new technologies increased the cost of pork production in North Carolina to the point where pork produced in North Carolina could not be profitably marketed at a price that is competitive with the price of pork produced in other states. Paragraph III.B.4.c of the Agreements does recognize that alternative technologies may cost more than the lagoon and sprayfield system, but the combination of this paragraph and paragraph III.B.4.b make clear that the added cost may not make the North Carolina pork industry non-competitive with the pork industry in other states.

III. Recommendations

Having established the foundation for this report, we now turn to our recommendations.

A. <u>Key Definitions</u>

To properly frame our recommendations (interpretive guidance), it is important to first define the following key terms from the Agreements.

Definition of "Competitiveness" –

For the hog production industry, this is a live hog production entity's relative standing among peer entities on the total cost to produce market hogs. An entity becomes non-competitive when its inability to fund production results in lost market share.

<u>Important note</u> – As discussed above, these Agreements apply only to farms located in North Carolina. North Carolina farms compete nationally with farms from all regions of

the United States. This is why "competitiveness" is the controlling economic determinant in the Agreements.

Definition of "Economic Feasibility" –

A technology would be economically feasible if and only if the commercial application of that technology in only North Carolina has no adverse affect on the fiscal competitiveness of North Carolina pork operations compared to pork operations in all other states.

Definition of "Pork Industry" –

As pork can only be derived from hogs, this industry includes any and all business entities that generate their income from either the production of live swine or the meat packing of pork.

B. Task 1 and Task 2 Documents

Task 1 Document –

One flaw in the Task 1 analyses was the decision to evaluate the cost of existing technology (lagoon and sprayfield) as if that system were new construction on a Greenfield site. As discussed below, use of the cost of new construction as the baseline against which to determine the added cost of a new technology is fundamentally inconsistent with the terms of the Agreement. Consequently, as the incremental cost difference (1000 lbs steady state live wt) drives the Task 2 analyses, the practice of computing existing technology cost as Greenfield makes those Task 2 analyses only applicable to future expanded construction. To be clear, the Task 1 Greenfield-based approach applied to the existing lagoon and sprayfield cost resulted in a dramatic understatement of the incremental cost difference between potential ESTs and current technology on all existing farms in production, whether those farms are company owned or farms operating under a service contract.

The Task 1 economic work was subjected to outside peer review scrutiny. That scrutiny served to endorse the work as performed. Much of the minor criticism mentioned in the reviews resulted from the Principal Investigators' emphasis on specific statements in the Agreements (10 yr annualized cost, etc.). The reviewers either were not provided the Agreements as a reference, or ignored the Agreements' importance to the work definition.

Therefore, with the exception of its use of a new lagoon and sprayfield system as the baseline for the cost comparison, we know of no reason why the information and results in the Task 1 document should not be considered by the Designee in the Technology Determinations.

Task 2 Document –

Important note - Again, the parties to the Agreements established "competitiveness" as the controlling economic factor.

As with the Task 1 work, the Task 2 work was subjected to a peer review process. After implementing some suggested slight modifications, the analysis was rerun resulting in very little difference to the original report. The result of the review process signals that the analysis successfully completed its objectives.

The Task 2 modeling effort arrived at the only answer that makes sense: If the cost of production for business entities of a commodity-based value industry for only a single geographic region (North Carolina only) is increased, those businesses in that region will be made non-competitive.

The term "commodity based" is the key. By definition, a commodity-based business is one for which the forces of supply and demand absolutely rule the market value price points. These market value price points will absolutely determine profitability for the business entities.

It is well documented that there have been and will be periods of time during which no hog production entity was/is profitable (due to either over supply or under demand). At this point, the business entities can continue to operate only for the time, which is equal to their cash flow deficit balanced to their cash assets available. Those entities, which have the highest use of cash relative to volume, will be the first entities to go broke. As entities go broke, the supply side changes and market price points move higher bringing the survivors back to profitability.

The pork industry is, by its nature, absolutely commodity based.

Today, all swine waste management systems in operation in this country incur very similar cost due to the fact that all currently operate under similar performance standards. This fact combined with the fact that these Agreements single out North Carolina, forces recognition that higher environmental standards equal higher cost. It is critical to recognize that this higher cost can only be off-set by sustainable byproduct revenues.

Important note - A measured change in herd size is a very good barometer of "change in competitive position". This measure allows not only a simple "yes/no" answer to the competitive question, but speaks to the degree of impact. The Agreements did not seek to close farms or otherwise reduce herd size in North Carolina.

C. Projected 10-year Annualized Cost Metric

As discussed above, one flaw in the Task 1 document is its use of the cost of constructing a new lagoon and sprayfield system as the baseline against which to measure and compare the added cost of new technologies. The following analysis shows that the

Agreements require that the comparison use the cost of the existing lagoon and sprayfield system.

Paragraph III.B.4.b of the Agreements calls for consideration of the projected 10-year annualized cost of (1) each alternative technology for each category of farm system, and (2) each category of farm system of a lagoon and sprayfield system that is designed and constructed in accordance with current laws, regulations, and standards. Although it is not clear from this language that the comparison is to involve the existing system rather than a new system, such a conclusion is inescapable in the context of the larger economic feasibility provisions of the Agreements.

As discussed above, the Agreements establish the "continued competitiveness of the North Carolina pork industry" as the controlling factor for purposes of economic feasibility determinations. The impact of an alternative technology on the continued competitiveness of the industry can be established only by determining the industry's ability to absorb the net added cost of the alternative technology. The industry is obviously competitive with the existing lagoon and sprayfield system and continued operation of this system would not add any significant new cost. Therefore, comparing the added cost of an alternative technology to the existing lagoon and sprayfield system captures all of the added cost of the alternative technology. Comparing the added cost of an alternative technology to a new lagoon and sprayfield system, on the other hand, would not capture all of the added cost of the alternative technology because a new lagoon and sprayfield system would involve a significant expenditure that the industry is not required to make. Such a comparison, therefore, would make the added cost of the alternative technology appear to be less than it really is.

Based on the above, we recommend that the projected 10-year annualized cost metric projected by the Task 1 study results for technologies that meet the "A" factor requirements, be compared to the existing lagoon and sprayfield system and not to a new system.

D. Projected Impacts on Quantity of Swine in North Carolina

The Designee also asked us how, in a quantitative sense, the projected impacts of adopting ESTs on the quantity of swine in North Carolina should be considered in the determination of economic feasibility? In responding, we must again turn to the language of the Agreements. Although the Agreements do not directly address this question, the controlling competitiveness factor strongly suggests that any technology with added cost so high that it would cause the closure of one or more well-managed, otherwise profitable farms and/or a significant reduction in the overall size of the herd in North Carolina would not be economically feasible because collectively, these individual farms and the present herd size make up the North Carolina pork industry. Indeed, this is the only possible answer to the question because any attempt to identify a particular acceptable quantity of farm closures or reduction in herd size would be reading a quantity in to the Agreements that is not there. The Agreements say nothing about farm closures or

reduction in herd size. Therefore, we can only recommend that the answer to your question is zero.

E. Impact of EST Implementation Schedule on Economic Feasibility

In response to your final question, we believe that EST implementation schedules can affect economic feasibility in several respects. First, shorter schedules will likely drive up the cost of design and construction because farms would be competing for the same design and construction services over a shorter period of time, thereby creating a demand for services greater than the supply. The forces of supply and demand will directly affect the cost of new technologies. Therefore, the length of implementation schedules must be considered when making determinations of economic feasibility.

Second, as stated above, the availability of significant revenues from the byproducts of new technologies will be significant factors in the economic feasibility analysis. Since the markets needed to produce these revenues are not now available, it is critical that the implementation schedules account for this fact through contingencies that avoid triggering obligations to implement ESTs until these markets are developed sufficiently to offset the added costs. The pace of implementation would move forward only to the degree that the byproduct price point would not be reduced, or at the pace at which byproduct supply relative to byproduct demand remains constant.

It is also important to recognize that taking a new technology from the trial phase to the commercial application phase will require reasonable system modification to obtain the same results as during the trial phase. There should be a reasonable period of time set aside for “minimum commercial” implementation. This will allow for system adjustments and provide protection from any potential catastrophic failures, which were not detected during the trial period.

IV. The Question of “Increased Cost”

Although not among the questions in your June 28, 2005 memorandum, we believe it is important to close by addressing a question that is directly related to the subject of this report; namely, based on an overall consideration of the economic feasibility provisions of the Agreements and the Task 1 and Task 2 study results, would any net increase in costs resulting from implementation of a new technology be economically feasible?

The short answer is “no”. The inescapable conclusion from the work completed to date is that byproduct revenue must exist to offset the significantly higher operating and capital costs of the new technologies. The prospect for fossil fuel substitutes has never been better and looks to become even more attractive in the future. This trend provides confidence that at some point in the near future there will be a waste management concept which can operate commercially while generating sustained positive cash flow that equals the higher operating and amortized capital cost (incremental to today’s technology).

The reality of converting waste into fossil fuel substitutes will meet resistance from today's utility and fuel companies. As the future unfolds, these companies will see the greatest profit margins in maintaining the status quo. Government will need to step in and provide the necessary leadership to minimize energy cost to the public. Only public support will provide the incentive for the politicians to take the positions necessary to drive government action supporting alternative fuels. All of these third party forces must be engaged in the development of the alternative fuel industry. To be sustainable, the alternative fuel industry will have to at least breakeven financially. The North Carolina hog industry is no different in this respect.