



Final Report

Economic Impacts of Proposed FDA Regulatory Changes to Regulation of Animal Feeds Due to Risk of Bovine Spongiform Encephalopathy

Contract No.
223-03-8500
Task Order 3

Submitted to:
Economics Staff
Office of Policy and Planning
Office of the Commissioner
Food and Drug Administration
Rockville, MD 20857

Submitted by:
Eastern Research Group, Inc.
110 Hartwell Ave.
Lexington, MA 02421

July 25, 2005

**ECONOMIC IMPACTS OF PROPOSED
FDA REGULATORY CHANGES TO REGULATION OF ANIMAL FEEDS
DUE TO RISK OF BOVINE SPONGIFORM ENCEPHALOPATHY**

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EXECUTIVE SUMMARY

SECTION ONE

FDA is considering a modification to its rules governing animal feed by supplementing or expanding the 1997 rule restricting the feeding of mammalian protein (except for porcine and equine protein) to ruminant animals. In the regulatory option under study in this report, FDA has defined prohibited cattle material (PCM) and would prohibit it from use in all animal feeds. PCM consists of the brain and spinal cord of:

- Slaughter cattle 30 months of age or older,
- All non-ambulatory disabled cattle,
- All cattle that died other than from slaughter, and
- Mechanically separated beef from cattle from which prohibited cattle materials (i.e., brain and spinal cord) were not removed.

These materials are not to be used in animal feed. Additionally, tallow that contains any PCM is considered PCM. All other tallow must meet purity requirements. No more than 0.15 percent hexane-insoluble impurities can be contained in tallow used in feed under the option considered.

This study examines the impacts of this regulatory option on the affected agricultural and food industries. In so doing, it extends previous research performed by ERG on several other regulatory alternatives FDA is considering. In particular, ERG's report of August 2004 examined different versions of an extended feed ban. Those regulatory options would prohibit a larger volume of cattle material from animal feed.

FDA's PCM alternative will directly prohibit a small share of animal offal from production of meat and bone meal (MBM) and tallow. The brain and spinal cord of an average slaughter cow weighs only 1.3 lbs. Slaughterers and renderers both have or can acquire the capability to remove such materials from the animals they process. Nevertheless, both slaughterers and renderers will often remove a larger share of the animal offal because (1) slaughterers generally cannot distinguish the age of an animal sufficiently early to affect processing, (2) independent renderers might require that their slaughter clients remove the entire skull for all animals in order to be sure that no brain materials are included in the offal they pickup, and (3) independent renderers that pick up deads and downers¹ might have to remove the entire spinal column (not just the spinal cord) if the carcass has deteriorated, as is often the case in summer.

The eventual disposition of PCM under this regulatory structure is uncertain. Some landfills might accept modest quantities of brain and spinal cords without further processing. More likely, some new disposal infrastructure will need to evolve in which PCM materials are processed through chemical digester units or rendered prior to disposal. Newly emergent commercial entities or existing renderers might fill this gap. Because the volumes of materials generated is not sufficiently large for efficient processing (relative to the flows for other agricultural materials

¹ The term downer is used, although the animal must be humanely euthanized prior to transporting.

like renderable animal offal), disposal or rendering for disposal charges for these materials will exceed current costs for rendering. ERG used an assumed charge of \$12 per hundredweight for disposal or rendering for disposal.

Using the assumptions and estimates of the PCM quantities withdrawn from productive use, the overall impact of the regulatory option on slaughtering and rendering processes is modest. The amount of material removed from the rendering stream amounts to 0.1 percent of MBM production and less than 0.1 percent of tallow production.

ERG also estimates the costs of meeting tallow purity requirements and the costs for renderers to add equipment and labor to remove PCM from cattle prior to processing deads and downers. Total compliance costs are estimated at \$15.9 million, as shown in Table ES-1.

Table ES-1. Summary of Costs

Cost Component	Cost
Capital and O&M costs for slaughterers to remove PCM	\$675,601
Lost MBM and tallow values of PCM	\$1,769,448
Lost MBM and tallow values of disposed deads and downers	\$1,006,236
Capital and O&M costs for renderers to remove PCM	\$1,883,459
Costs of tallow impurity restrictions	\$1,779,020
Recordkeeping and labeling	\$62,354
PCM marking (maximum)	\$12,574
Dead and downer disposal costs to farmers	\$1,022,633
Disposal costs for PCM (renderers and slaughterers)	\$7,718,072
Total	\$15,929,397

SECTION TWO

REGULATORY IMPACTS ON AGRICULTURAL SECTORS

The section examines impacts of the rule prohibiting bovine brain and spinal cord material in the food or feed of all animals. ERG generated much of the information for this section through discussions with slaughterers, renderers, and manufacturers of other affected agricultural products. In order to avoid revealing facility plans or any other potentially confidential business information, the individuals contacted are not identified. ERG gratefully acknowledges the assistance of numerous agricultural industry executives.

2.1 Defining the Prohibited Quantities Generated in Slaughtering

US FDA has prepared a regulatory option prohibiting certain cattle materials from animal food or feed. The rule defines prohibited cattle material (PCM) as including *the brain and spinal cord* of (1) slaughter cattle greater than 30 months of age, (2) all non-ambulatory cattle, (3) cattle that died other than by slaughter, as defined by USDA, and (4) any cattle to be processed using mechanical separation, unless brain and spinal cord have been removed prior to separation. Additionally, any tallow that includes any PCM is considered PCM. All other tallow must meet purity requirements. No more than 0.15 percent hexane-insoluble impurities can be contained in tallow used in feed under the option considered.

To comply with these requirements, slaughterers might have to modify their animal killing operations to separate brain and spinal cord and deliver these materials to a disposal or disposal rendering facility. Federally inspected slaughterers have been routinely removing the spinal cord, and brain, based on discussions with Rempe (2005), in order to comply with FDA requirements regarding cattle processing for human food use. These parts are now mixed with general offal, and the plants will have to change their practices to remove PCM for separate handling and disposal. This change might require investments in modifications to the kill floor, additional labor during slaughtering, changes in the transport of animal byproducts through the slaughtering facility, and payments for disposal or processing and disposal of the materials. Due to the small volumes of PCM involved, however, major process changes are not expected. Most slaughterers can collect PCM in bins and manually transport them to a disposal area in the plant. Space constraints or other issues may require some additional changes besides purchases of dedicated disposal bins for PCM.

By removing PCM from the material going to rendering, this regulatory option slightly reduces the quantities of MBM and tallow produced. Part of the regulatory impact of a ban on the PCM in animal food and feed is, therefore, the loss of value for these banned materials from these productive process flows.

Under the definition of PCM, ambulatory cattle under 30 months of age do not generate any PCM and their slaughter and disposition would not be affected by the rule. At this time,

however, large slaughterers do not have a practical means for determining age of slaughter animals at a point sufficiently early in processing to affect processing of the animals. Therefore, ERG forecasts that most large slaughterers will handle all cattle as if they are over 30 months of age, even though the vast majority of slaughtered animals are less than 30 months of age (Harlan, 2005). Small slaughterers generally handle a larger percentage of older animals. All so-called deads and downers (animals that died other than by slaughter and non-ambulatory cattle), regardless of age, will also generate banned materials. This analysis assumes that all cattle will have, at a minimum, brain and spinal cord removed prior to processing.

To quantify the generation of PCM, ERG used estimates provided by Dave Harlan, Byproducts Marketing Manager for Cargill Taylor Beef Business Unit (Harlan, 2004a). Other sources provide slightly different estimates of PCM weight per cow but ERG judged that the Harlan estimates were reasonably consistent with other estimates and were consistent with other useful elements in his analysis.

Included in these data are weight estimates for the skull and spinal column. Under certain circumstances, slaughterers or renderers might opt to discard the skull and spinal column if there is uncertainty as to the efficiency of removal methods or other concerns related to compliance. Some renderers might be unwilling to handle skulls from which brain has been removed due to their concerns about liability and the need for assuring proper brain removal (Myers, 2005). Also, brain and spinal cord removal from dead animals can be problematic if the death was not recent, particularly during the summer. This group might comprise up to 35 percent of dead cattle processed annually (Bisplinghoff, 2005a).

The estimates presented in Table 2-1 show the quantity of materials slaughterers or renderers would remove from the productive material flow prior to acquiring information about the animals' age. Under those terms, slaughterers would extract from 1.3 pounds of PCM (for a steer that is or is assumed to be more than 30 months of age) up to 53 pounds of PCM (for an animal where efficient removal of PCM is not possible). Thus, the weight removed will vary with the age or condition of the animal and the capability of the facility processing the animal. The average total cattle weight at slaughter was calculated in 2003 at approximately 1,250 lbs, of which hides and skin represent approximately 5 percent and cattle offal represents 34.1 percent (Sparks International, Inc, 2001). This translates to approximately 425 lbs of offal per animal before PCM are removed. Based on these calculations, PCM will represent 0.3 percent to 12.5 percent of offal from each animal.

The pre-regulatory value of the PCM was estimated using a four-year average of byproduct market prices. Thus, MBM was valued at \$0.09 cents per lb (\$180 per ton) and tallow was estimated at \$0.18 per lb (Harlan, 2004a). With these assumptions, Table 2-1 also shows the average value of these ingredients in the rendering uses at about 2 cents for the majority of slaughter cattle up to \$3.36 for certain dead cattle, when losses for both MBM and tallow are summed.

Table 2-2 presents the estimated quantities of PCM produced per year. The total includes the quantities of PCM from dead and downer cattle and from slaughtered animals. The PCM calculations were based on the 2003 annual cattle slaughter of approximately 35.3 million

animals (USDA, 2004). The table includes several estimates concerning the current share of dead and downer animals now rendered (Harlan, 2004a). The table also includes ERG’s forecasted share of deads and downers that will be rendered after implementation of the PCM ban (discussed further in Section 2.3). ERG projects only modest declines for rendered dead and downer animals. Most of the animal offal can still be rendered for animal feed purposes, based on the coverage of this regulatory option.

Table 2-1. Estimated Volumes and Value of PCM, per Ambulatory or Non-Ambulatory Cow Slaughtered

Cattle part	Pounds	MBM Yield (%)	Tallow Yield (%)	MBM Yield (lbs)	Tallow Yield (lbs)
Brain	0.936	6%	5%	0.06	0.05
Spinal cord	0.374	7%	5%	0.03	0.02
Skull (including trigeminal ganglia, not incl. brain)	15.200	44%	11%	6.69	1.67
Vertebral column	36.500	48%	13%	17.52	4.75
Total – for slaughter cattle assumed or known to be more than 30 months old and other fresh dead cattle	1.31			0.08	0.07
Total – for slaughter cattle at small plants where brain is not extracted (skull becomes PCM)	16.51			6.77	1.74
Total—for dead cattle where skull and spinal column removed	53.01			24.29	6.48
Lost value for most slaughter and fresh dead cattle from previously rendered byproducts (\$)				\$0.007	\$0.012
Lost value for slaughter cattle for which brain is not removed from skull (\$)				\$0.61	\$0.31
Lost value for dead cattle from which brain and spinal cord are not removed from skull and spinal column (\$)				\$2.19	\$1.17
Price per lb for byproducts (\$)				\$0.09	\$0.18

NA=Not applicable or not available

Source: Harlan, 2004a. Other sources provide different average weights for various cow parts.

Federally inspected plants are assumed to currently remove the brain and spinal column to meet USDA requirements for processing cattle used for human food (Rempe, 2005). State inspected plants or possibly other smaller plants might not remove the brain from the skull, considering the entire skull as PCM in the production of human food. In Table 1-6 of ERG’s Alternatives Report (ERG, 2004), it is noted that the smallest plants (those with fewer than 10 employees) slaughter only 1 percent of cattle. These plants are assumed either to be unaffiliated with rendering facilities (that is, they are not owned by a packer/renderer) or they do not have the volumes of material and reputation to encourage a renderer to take the materials and to assure the renderer that they have adequately removed the brain from the skull. ERG therefore assumes that 99 percent of slaughter cattle will have brains removed for disposal, allowing the skulls to be rendered.

ERG also assumes that 75 percent of dead and downers are dead prior to pick up, and of the dead cattle, 65 percent can be processed to remove brain and spinal cord (based on discussions with Bisplinghoff, 2005a). The other 35 percent will need to have the skull and the entire spinal

column removed and treated as PCM due to decomposition. Downers can be handled as fresh kills. Since only renderers handle dead and downers, brain and spinal cord removals are under their control, and the renderers can be sure that complete brain removal has been accomplished. Thus, it is assumed that brain removal will be done on dead and downer animals to the extent practical.

Aggregating these values over the total volume of cattle offal generated per year under a PCM restriction, the calculations show that PCM previously valued at \$1.0 million per year for MBM production will now be sent for disposal. Additionally, such materials would have produced \$0.8 million worth of tallow per year if not sent for disposal. The combined lost product value is \$1.8 million per year. This figure might be somewhat high because the high water content of brain and spinal cord make them relatively expensive to render. If these wastes can be disposed of without rendering or other processing, the loss of value might be largely offset after accounting for the cost savings of no longer rendering these wastes (Harlan, 2005).

Alternatively, these estimates of the loss of productive value will be low if fewer slaughterers choose to salvage the skull by removing the brain (and renderers also do not try to remove the brain but dispose of the entire skull). This might occur if FDA requires highly thorough removal (for example, better than 99%). Many slaughterers and renderers might be hesitant to invest in equipment if they think that it will be too difficult to meet the required removal effectiveness. According to Harlan (2005), at least one Cargill facility is able to remove on average 99% of brain material (ranging from 98.1 percent to 99.9 percent removal). The analysis above assumes that this level of removal is feasible for most slaughterers and renderers who choose to remove brain and will be acceptable to FDA. These figures might also be low if more renderers choose to not collect the dead and downers (leading to losses in rendered product equal to the rendered portion of the full weight of cattle not collected).

2.2 Slaughtering Investments and Operating Costs for Removal of PCM

Cattle slaughterers will consider modifications to separate brain and spinal cord from the rest of animal offal for incoming cattle. For costing capital investments, ERG assumed that large slaughterers would separate brain and spinal cord from other offal, salvaging the skull for rendering. (As noted above, smaller slaughter operations might choose not to remove the brain from the skull and thus will consider the entire skull waste.) To the extent that slaughterers do not separate brain from the skull, incremental labor costs might be lower but the loss of product value for rendered material will be higher than that estimated here.

Table 2-2. Prohibited Material Quantities from Slaughter Cattle and from Dead, Downer and Antemortem Condemned Cattle

	Number of Head (000)(a)	Current Percent Rendered(b)	Forecast Percent Rendered (c)	Number Rendered (000)	Avg. Wt. Per Head (lbs)	Total Wt. (000lbs) (e)	MBM Yield (%)	Tallow Yield (%)	Total MBM Yield (000 lbs)	Total Tallow Yield (000 lbs)
Slaughter PCM										
Federally inspected plants (99% of slaughter cattle)	34,918	100%	100%	34,918	1.3	45,743	(d)	(d)	2,875	2,287
State inspected plants (1% of slaughter cattle)	353	100%	100%	353	16.5	5,823	(d)	(d)	2,388	613
Prohibited materials totals	35,271			35,271		51,566			5,263	2,900
Deads and Downers Prohibited Materials										
All deads under 500 lbs	2,365	5%	4.5%	106	1.3-53.01	2,065	(d)	(d)	910	246
Feedlot deads	300	90%	90%	270	1.3-53.01	5,239	(d)	(d)	2,310	624
Beef cow deads	1,050	10%	9%	95	1.3-53.01	1,834	(d)	(d)	808	218
Beef cow downers	350	10%	9%	32	1.3	41	(d)	(d)	3	2
Dairy cow deads	300	60%	60%	180	1.3-53.01	3,493	(d)	(d)	1,540	416
Dairy cow downers	100	60%	60%	60	1.3	79	(d)	(d)	5	4
Deads and downer totals	4,465	17%	17%	742		12,751	(d)	(d)	5,576	1,511
Total - All PCM, slaughter and dead and downer animals						64,317			10,839	4,411
Value of animal byproduct/per lb if rendered (\$)									\$0.09	\$0.18
Value of cattle PCM, if rendered (\$)									\$473,682	\$521,997
Value of deads and downers, if rendered (\$)									\$501,866	\$271,903
Total market value of byproducts (\$)									\$975,548	\$793,900

(a) ERG assumed that 94 percent of cattle slaughtered will have brain removed (see text). The total slaughter figure for cattle is based on the 2003 slaughter statistics (USDA, 2004). Dead and downer estimates were derived from Harlan, 2004a. Deads are assumed to make up 75% of the total dead and downer total.

(b) Estimated by Harlan, 2004a.

(c) ERG estimates.

(d) See calculations in Table 2-1. For dead and downers, this reflects a weighted average yield for brain and spinal cord (65%) and skull, brain and spinal cord (35%).

(e) Weighted average derived between freshly killed animals (65%), which are assumed to have brain and spinal cord removed, and other dead (35%), which are assumed to have skull and spinal column removed.

Source: Information provided by Harlan, 2004a, except where otherwise specified.

Because the volume of wastes is so modest, industry experts contacted by ERG believed that even the largest plants can choose manual approaches to separation and PCM removal. At such operations workers might remove brains or skulls and spinal cord and place them into portable bins that are then wheeled to a waste collection area for removal by the eventual processor/disposer.

ERG sought information on the cost of slaughter facility modifications from slaughtering facilities. One contact, whose firm slaughters over 400,000 cattle per year, indicated that the firm had installed brain removal equipment, including an auger for transporting skulls to a clean out area, and vacuum equipment to extract the brain. The cost of brain removal equipment 8 years ago was about \$55,000 to \$60,000. One full-time equivalent employee operates this equipment, not only removing the brain, but also segregating the waste into bins. These brains and spinal cords are collected in bins and transported for disposal at the end of the day (Harlan, 2005 and 2004c). Another contact indicated that Food Safety and Inspection Service (FSIS) personnel effectively require all federally inspected slaughterers to remove the brain and spinal cord because they do not allow dripping spinal and brain fluids or other such materials in the process stream. Thus, most facilities remove the brain and spinal cord already and direct the materials to rendering. This contact indicated that the only incremental costs for the PCM alternative will be some portable bins and labor time to redirect brains and spinal cords from the rendering line to a disposal line. Also, despite a high level of automation in this slaughter plant, the contact indicated that no substantial new capital equipment would be needed (Rempe, 2005). These and other industry contacts generally indicated that if a rule prohibited only brain and spinal cord, the costs to comply would be small.

Based on these discussions and the unit cost data for simple material handling bins, ERG estimated the capital investments needed to comply with a PCM regulation. Small operations can use inexpensive portable bins to collect PCM. ERG allots \$150 for the purchase of bins at the smallest plants with one to four employees. ERG allots \$300 at plants with five to nine employees. At larger plants, however, due to the increasing size, complexity and processing speed, ERG has allowed \$500 for the purchase of larger bins and additional costs for planning and for possible alterations to processes or procedures. Those processing up to an average of 110 head per day are assumed to purchase bins, but are assumed not to require any significant modifications to processes or procedures. As the number of head processed increases, somewhat higher capital costs are assumed to be needed due to the more automated and complex processes found at larger facilities (see Table 2-3). These assumptions result in annualized costs of \$79,000 per year.

If slaughterers could ensure that all their cattle are less than 30 months of age, incremental costs would be even smaller. As noted previously, however, slaughterers reported that they can only tell cattle age reliably from postmortem observations of cattle teeth. For example, a large slaughterer reported that while their buyers seek only younger cattle, their typical kill includes 1 to 2 percent older cattle. None of those slaughterhouse executives plan to implement any system that could reliably exclude the older animals from their facilities. If better processes are developed for cattle identification, there should eventually be the means for slaughterers to pre-identify cattle ages and therefore avoid many of the PCM removal and segregation costs.

Table 2-3. Estimated Investment Costs for Slaughter Facility PCM-Related Modifications

Annual Slaughtering Rates Per Facility	Number of Slaughtering Plants	Midpoint of Slaughter Rate		Estimated Capital Cost (\$)	Aggregate Capital Expenditures	Annualized Capital Expenditures (b)	Addit. Staff Required (c)	Incremental Payroll		Aggregate Incremental Payroll	Agg. Incremental Annual Costs (\$)
		Annual	Per Day (a)					Per Facility (d)	Per Cow		
1-999	508	500	2	\$150	\$76,200	\$10,849	0.00	\$0	\$0	\$0	\$10,849
1,000-9,999	89	5,500	20	\$300	\$26,700	\$3,801	0.01	\$313	\$0.06	\$27,829	\$31,630
10,000-49,999	26	30,000	110	\$500	\$13,000	\$1,851	0.02	\$625	\$0.02	\$16,259	\$18,110
50,000-99,999	11	75,000	275	\$1,000	\$11,000	\$1,566	0.02	\$625	\$0.01	\$6,879	\$8,445
100,000-199,999	12	150,000	549	\$2,000	\$24,000	\$3,417	0.07	\$1,876	\$0.01	\$22,513	\$25,930
200,000-299,999	8	250,000	916	\$5,000	\$40,000	\$5,695	0.10	\$2,814	\$0.01	\$22,513	\$28,208
300,000-499,999	11	400,000	1,465	\$8,000	\$88,000	\$12,529	0.16	\$4,690	\$0.01	\$51,592	\$64,122
500,000-999,999	9	750,000	2,747	\$10,000	\$90,000	\$12,814	0.44	\$12,507	\$0.02	\$112,565	\$125,379
1,000,000-1,499,999	13	1,250,000	4,579	\$12,000	\$156,000	\$22,211	0.74	\$21,262	\$0.02	\$276,410	\$298,621
Over 1,500,000	2	1,750,000	6,410	\$15,000	\$30,000	\$4,271	1.05	\$30,017	\$0.02	\$60,035	\$64,306
Total					\$554,900	\$79,005				\$596,596	\$675,601

(a) Approximate average slaughter rate per day assuming facility operates 5.25 days per week or 273 days per year.

(b) Annualized at a 7 percent discount rate over 10 years.

(c) Additional staff requirements are ERG estimates, based on pounds of PCM handled daily and bin capacity, and a round-trip time to a disposal area in the plant that varies from 10 minutes at small plants to 20 minutes at large plants. See also discussion in the text.

(d) Based on an assumed payroll per worker of \$28,588, derived by calculating BLS' Occupation Employment Statistics data for production workers in the slaughtering and meat packing industry. The estimate includes a 40 percent markup from a base wage of \$20,420.

(e) USDA/NASS, 2003.

Source: Costs estimated by ERG based on discussions with slaughter facility and judgments of ERG staff.

Nevertheless, because such systems are not yet available, ERG assumed that all facilities would implement the renovations and would remove PCM from all animals processed, regardless of age.

Labor costs are estimated on the basis of discussions with industry indicating that even at the largest plants, one full time person could handle the PCM separation and disposal. ERG assumes that small plants will need significantly less than one full time person to handle the PCM separation and disposal. For the smallest plants, these tasks might amount only to minutes a day. For example, a small plant might need to empty the PCM bin into its storage container once at the end of the day. For larger plants, more labor time is needed as bins must be emptied frequently and distances to the PCM storage area or disposal process equipment increase with the plant size. ERG estimated that the incremental staffing will range from no additional staffing at the smallest plants to very slightly over 1 employee at the largest plants. Note that per head costs generally trend down, but at the larger plants, the cost rises slightly due to the assumption of increasing time to transport material manually to the PCM storage or disposal area or process (see Table 2-3). Using the labor costs as shown in the table footnotes, ERG estimates that labor costs will total \$0.6 million per year. Total annual costs of capital and labor are estimated to be \$0.7 million per year.

Table 2-4 presents these costs on a facility basis by size, showing the percentage of these costs on an annual basis as a percentage of the value of shipments at each facility by size.

Table 2-4. Estimated Annual Costs for Slaughter Facility Investments Related to Prohibited Materials as a Percentage of the Value of Shipments

Annual Slaughtering Rates Per Facility	Midpoint of Annual Slaughter Range	Number of Slaughtering Plants	Per Facility Shipments (000) (a)	Per Facility Incremental Annual Costs (\$)	Costs as % of Shipments	Avg. Incremental Annual Costs Per Cow
1-999	500	508	\$468	\$21	0.005%	\$0.04
1,000-9,999	5,500	89	\$1,347	\$355	0.026%	\$0.06
10,000-49,999	30,000	26	\$2,827	\$697	0.025%	\$0.02
50,000-99,999	75,000	11	\$8,959	\$768	0.009%	\$0.01
100,000-199,999	150,000	12	\$23,950	\$2,161	0.009%	\$0.01
200,000-299,999	250,000	8	\$73,984	\$3,526	0.005%	\$0.01
300,000-499,999	400,000	11	\$171,358	\$5,829	0.003%	\$0.01
500,000-999,999	750,000	9	\$279,788	\$13,931	0.005%	\$0.02
1,000,000-1,499,999	1,250,000	13	\$721,953	\$22,971	0.003%	\$0.02
Over 1,500,000	1,750,000	2	\$1,518,618	\$32,153	0.002%	\$0.02
Total/Average		689		\$981		

Source: Costs estimated by ERG based on discussions with slaughter facility and judgments of ERG staff.

(a) Shipment data is from the 1997 Economic Census for NAICS 311611, Animal Slaughterers. USDA/NASS slaughter rate size groups are matched to Census employment-based size groups. BLS's Consumer Price Index is used to inflate shipments to 2003 dollars.

2.3 Disposal Alternatives and Costs

Slaughterers and renderers have various possibilities for disposing of PCM. The cost estimates attributable to these strategies are dependent upon important assumptions about:

- processing disposal facility size,
- operating characteristics,
- landfill permitting and siting requirements and operating regulations,
- environmental requirements,
- transportation distances (i.e., PCM suppliers),
- recovery and market value of process end products for productive use or fuel,
- eventual federal or state regulatory requirements beyond environmental or permitting requirements,
- mix of raw materials, including PCM flows and/or entire animal carcasses,
- on-farm or dedicated commercial operation.

Given the lack of industry experience with the disposal alternatives, the cost analysis includes speculative elements. Economic principles would require that the lowest cost allowable disposal option predominate. It is also likely that industry will develop approaches that are more cost-effective than have been demonstrated thus far. Given the limited basis for assessing the available disposal options, however, ERG has relied on various published and industry-developed cost estimates. The options examined include:

- ***Landfilling*** – In this option, cattle PCM are separated at slaughter or rendering and sent directly to landfill disposal with no processing. Actual disposal costs could vary substantially with local conditions and the county and/or state willingness to accept materials.
- ***Rendering for disposal*** – In this scenario, landfills do not accept PCM without their first being processed, i.e., rendered prior to disposal. The rendered PCM (which are currently processed into MBM and tallow) are then disposed of or burned for their fuel value. In the Alternatives report, ERG examined the potential cost of large-scale rendering for disposal and used an industry-supplied estimate for the cost of \$6 per hundredweight (cwt) of material (Harlan, 2004a).

Industry sources indicate that the cost of rendering is highly dependent upon the volume of material process. Under this regulatory option, renderers could process normal MBM and tallow as well as PCM for disposal in the same facility, although they could not use the same equipment. Because relatively small volumes of PCM are prohibited, rendering for disposal would occur at relatively uneconomic quantities. This makes the likelihood that renderers would seek to establish a rendering-for-disposal business quite unlikely. Nevertheless, judgments of the economic viability of such processes are speculative.

- ***Disposal through alkaline hydrolysis digesters*** – Digesters are estimated to cost \$1 million or more for relatively substantial units (Meat News.com, 2004). Due presumably to their relative expense and the limited industry experience with them, industry has only

begun to examine this technology. An ERG project consultant estimated the operating costs at roughly 3 cents per lb, before transportation costs and profits (Bisplinghoff, 2004).

- **Incineration** – Incineration might be accomplished in centralized facilities or (for animal producers) in small on-farm incinerators. Based on one set of industry estimates, the variable (operating) costs of incinerating dead cattle in small on-farm incinerators are \$9.33 per cow (Sparks International, Inc. 2002). The fixed investment costs are \$4,500 for units sized for individual farms, but considerably higher for industrial-size units. Permitting and siting for incineration units might generate considerable local political opposition. The significance of such issues has not been quantified.
- **Composting** – Sparks estimates the operating costs per dead cow for on-farm composting at over \$34 per cow (Sparks International, Inc., 2002). Large commercial-scale operations would incur smaller per cow operating costs. Investment costs are estimated at \$7,000 per farm. Larger capital investments for land and other inputs are needed for industrial-size units.

For the cost analysis, ERG used the \$12 per cwt value to characterize PCM disposal without forecasting exactly how materials will be disposed. ERG judges this value to be an amply conservative estimate of potential costs and is used to avoid underestimating costs.

Some industry personnel suggested that landfilling would be relatively common as small slaughterers could dispose of PCM merely by adding it to their trash. But other industry executives have noted that state regulations prohibit disposal of unprocessed dead animal parts or carcasses in landfills. For example, several Midwestern states prohibit disposal of animal carcasses in landfills. Given the potential for regulatory opposition to landfilling of PCM, ERG judged that landfilling will be only one of several possible disposal options.

In order to consider costs specifically from the slaughterer viewpoint, ERG assumed that slaughterers will pay for some type of disposal or processing-for-disposal at a cost of \$12 per cwt of raw material. Over time, industry efficiency in handling PCM will probably increase as packer/renderer and rendering plants are reconfigured. Nevertheless, ERG judged that the industry anticipation of relatively high processing costs was justified.

The \$12 cwt cost is also assumed to cover transportation charges to processing and/or disposal locations. In the ERG report on regulatory alternatives, ERG assumed that transportation costs would range from \$1 to \$1.75 per cwt based on information provided by industry for transport of larger quantities of prohibited materials (e.g., Harlan, 2004a and other discussions). That transportation cost estimate represents an implicit assumption that there will be relatively few disposal or processing plants, and that slaughterers would often need to ship prohibited materials a substantial incremental distance beyond existing transportation distances. In any case, FDA might allow sealed containers of PCM to be transported with non-PCM animal offal. This latitude would prevent transportation costs per cwt from being particularly high.

The disposal of deads and downers will generate incremental costs for farmers and other animal operations. Table 2-5 presents the incremental disposal costs for dead and downer animals resulting from the prohibition of PCM from deads and downers being used in animal feed. Currently, about 17 percent of deads and downers are being rendered for MBM and tallow. As a result of the PCM ban, slightly fewer animals will be rendered because of the change in the post-regulatory economics of renderer pickups. With the loss of some value of rendered MBM from deads and downers that is caused by a ban on PCM, renderers are forecast to charge higher fees for picking up deads and downers, especially from small suppliers of carcasses in remote areas. Consequently, more farmers will now dispose of their animals on the farm itself.

ERG forecast a plausible change in rendering levels caused by the increase in pickup charges, as shown in Table 2-5. ERG judges that for some operations, specifically those with deads weighing less than 500 pounds and beef cows, a somewhat smaller proportion of deads and downers currently being rendered would now be disposed of on-site. The impact on the disposal methods for dairy cow operations and feedlots is forecast to be negligible because these operations have fewer onsite disposal options. These operations do not have significant amount of physical space or the resources to carry out on-site disposal of animals. In sum, an estimated 0.6 percent of all deads and downers, or 26,000 animals that were previously rendered are forecast now to be disposed of on the farm.

While farming operations will select the method of disposal for dead and downer animals most appropriate to their practices, for this analysis ERG assumes that all operations will choose to bury dead animals. As reported in a Sparks International, Inc. study of disposal methods, total costs for burial are cheaper than costs for incineration or composting, largely because burials don't require capital investments in specialized facilities (Sparks, 2002).

ERG used the methodology presented in the Sparks (2002) report to estimate the costs of burials. In the report, the time requirement for burials is estimated to be 10 minutes for animals under 500 pounds and 20 minutes for animals over 500 pounds. ERG converted these time estimates to costs using a loaded labor rate for all occupations in animal production support activities as reported by BLS's Occupational Employment Survey (BLS, 2004). For equipment costs, ERG used the estimates reported by Sparks (2002) for the rental or depreciation of a backhoe (\$35 per hour). ERG allocated an entire hour of equipment time on average per animal to accommodate cases where backhoes might need to be rented or acquired from another site. In general, however, ERG assumed that the large majority of incremental burial activity occurs where backhoe equipment is readily available. Total disposal costs for dead and downer animals that will be disposed of instead of rendered as result of the PCM ban is estimated to be \$1.0 million per year.

Table 2-5: Incremental Disposal Costs for Dead, Downer and Antemortem Condemned Cattle

	Number of Head (a)	Current Percent Rendered (b)	Forecast of Percent Rendered (c)	Incremental Percent to be Disposed	Number of Animals to be Disposed	Labor Cost of Disposal (d)	Equipment Cost of Disposal (e)	Total Disposal Costs
Deads and Downers								
All deads under 500 lbs	2,365,000	5%	4.5%	0.5%	11,825	\$35,262	\$413,875	\$449,137
Feedlot deads	300,000	90%	90%	0%	0	\$0	\$0	\$0
Beef cow deads & downers	1,400,000	10%	9%	1%	14,000	\$83,496	\$490,000	\$573,496
Dairy cow deads & downers	400,000	60%	60%	0%	0	\$0	\$0	\$0
Deads and downer totals	4,465,000	17%	17%	0.6%	25,825	\$118,758	\$903,875	\$1,022,633

- (a) Estimated by Harlan, 2004a.
- (b) Estimated by Harlan, 2004a.
- (c) ERG estimates.
- (d) Estimated at 10 minutes for cattle under 500 lbs and 20 minutes for cattle over 500 lbs (as described in Sparks, 2002), using the average hourly loaded wage rate for all occupations within the industry performing support activities for animal production from BLS's Occupational Employment Statistics (\$17.89).
- (e) Estimated rental cost of a backend hoe (as described in Sparks, 2002) at \$35 an hour. One hour is assumed as implicit rental time. Virtually all incremental burial activities are forecast to occur on site at farms where backhoe equipment is available or can be quickly made available. To account for some rentals of backhoe equipment, however, an hour of equipment time per head has been assumed.

The reduction in deads and downers collected will also reduce renderers' revenue. Given the small decline in the value of deads and downers for rendering, renderers will reduce the supply of rendering services, and the price of services will increase slightly. At the new price equilibrium, farmers will request slightly fewer renderer pickups. Renderer throughput (and production of MBM and tallow) will also decline slightly.

Table 2-6 shows the value of lost MBM and tallow from deads and downers no longer collected by renderers. Lost MBM values are estimated to total \$430,650 and lost tallow values are estimated to total \$575,586 per year, for a total impact on renderers from lost revenues of \$1.0 million.

Table 2-6. Revenue Losses to Renderers from Deads and Downers No Longer Being Rendered.

	Number of Animals No Longer Rendered (a)	Average Weight Per Head	Total Weight Lost to Rendering	MBM Yield (b)	Tallow Yield (b)	Pounds of MBM Lost	Pounds of Tallow Lost	Value of MBM Lost (c)	Value of Tallow Lost (c)
All deads under 500 lbs	11,825	200.0	2,365,000	20%	18%	473,000	425,700	\$42,570	\$76,626
Feedlot deads	0	750.0	0	20%	20%	0	0	\$0	\$0
Beef cow deads & downers	14,000	1,100.0	15,400,000	28%	18%	4,312,000	2,772,000	\$388,080	\$498,960
Dairy cow deads & downers	0	1,300.0	0	30%	15%	0	0	\$0	\$0
Deads and downer totals	25,825	NA	17,765,000	NA	NA	4,785,000	3,197,700	\$430,650	\$575,586

(a) From Table 2-5.

(b) Harlan, 2004a.

(c) MBM valued at \$0.09 and tallow valued at \$0.18. See Table 2-2.

Table 2-7 summarizes the incremental slaughtering costs and the cost of PCM disposal at the assumed \$12/cwt. The disposal cost assumption is set sufficiently high to reflect uncertainty about the ultimate mode of PCM management and disposal and to accommodate the range of possible disposal alternatives, including digestion, rendering for disposal, and transport and landfilling costs. This table also includes the disposal costs for deads and downers and the associated revenue losses estimated for renderers. The total incremental slaughtering and PCM disposal costs is \$6.9 million per year. Adding the disposal costs and lost rendering revenues for deads and downers brings the total cost to \$10.4 million per year.

The two cost columns shown in Table 2-7 also define the approximate distribution of costs incurred most immediately by slaughterers and by others. (The ultimate distribution of impacts is more diffuse as slaughterers and others pass costs on to their suppliers or customers.) Thus, the first column of costs shows the costs incurred for PCM removed during slaughtering. These costs will be distributed by slaughterers backward to cattle suppliers in the form of lower prices paid for cattle and forward to meat consumers. The costs in the deads and downers column in the table summarize the incremental costs applicable to owners of these animals, including ranchers, dairy farmers, and feed lot owners. Animal owners might seek alternative disposal methods to avoid possible higher costs due to rendering for a substantial portion of the animals (up to 53 pounds might be considered waste). Renderers will not be willing to handle PCM unless adequate service charges are paid.

Table 2-7. Prospective Annual Costs for Slaughtering Modifications, Disposal Costs for Slaughter Cattle and Dead and Downers, and Lost Rendering Revenues from Disposal of Deads and Downers

Quantity and Cost Factors	PCM from Slaughterers	Deads and Downers	Total
Unprocessed prohibited material quantity (000 lbs)	51,566	12,751	64,317
Prospective rendered yield (MBM and tallow (000 lbs)	5,263	5,576	10,839
Disposal costs for deads and downers (\$)		\$1,022,633	\$1,022,633
Incremental annualized in-plant slaughter costs (\$)	\$675,601	NA	\$675,601
Approximate disposal and/or disposal processing cost, per cwt of raw material (a) (\$)	\$12.00	\$12.00	\$12.00
Aggregate disposal cost estimates (\$)	\$6,187,944	\$1,530,128	\$7,718,072
Lost revenues for renderers of deads and downers no longer rendered (\$)		\$1,006,236	\$1,006,236
Net costs, all category costs and lost revenues (\$)	\$6,863,545	\$3,558,997	\$10,422,542

(a) Estimated by ERG. See text.

(b) Estimated by ERG based on information assembled from industry. See text.

(c) Incremental costs for material disposal from prohibited materials processing. See text.

(d) Incremental transportation costs for moving material from the prohibited materials renderer to the landfill are assumed to be included in the landfill cost assumption.

NA=Not available

Source: ERG estimates, with inputs as described.

2.4 Rendering Industry Impacts from PCM Disposal Requirements

By directing that PCM be removed from animal feed, FDA's rule will affect renderer economics. Table 2-8 places the reduction in raw materials submitted for rendering within the context of overall rendering material flows. Based on Sparks Inc. (2001), integrated packer/renderers and independent renderers produce approximately 6.65 billion lbs per year of MBM. Poultry-based feeds add an additional 4.27 billion lbs. The industry also produces an estimated 9.57 billion lbs per year of tallow (US Census, 2003). The removal of PCM from slaughtered and dead and downer cattle currently picked up by renderers will remove 10.8 million lbs of MBM and 4.4 million lbs. of tallow from productive use in feed. These figures represent 0.1 percent of all MBM and poultry-based feed production and less than 0.1 percent of all tallow production.

Given the structure of the rendering industry, independent renderers incur the largest share of impacts. These firms perform the only rendering of deads and downers. They will also incur relatively large material flow reductions. The proposed regulation would reduce MBM produced for use in animal feed by independent renderers by 0.2 percent. Assuming tallow that would otherwise be derived from these materials is also lost from productive use, this would affect 0.1 percent of industry tallow production.

Table 2-8. Removed Prohibited Cattle Materials as a Percent of Total MBM and Tallow Production

	Integrated Packer/Renderers	Independent Renderers	Total
Pork and other single-species, non-ruminant MBM	1,148.4	492.2	1,640.5
Ruminant only MBM	2,324.0	410.1	2,734.1
Mixed species MBM, with ruminant protein	1,131.6	1,131.6	2,263.1
Mixed species MBM, without ruminant protein	7.3	7.3	14.6
Total MBM, except poultry (million lbs/yr)	4,611.2	2,041.1	6,652.3
Total poultry-based products (million lbs/yr)	3,418.8	854.7	4,273.5
Reduction in MBM production			
Decline in MBM from PCM (million lbs/yr)	3.6	1.6	5.3
Decline in MBM from downers and deadstock (million lbs/yr)	0.0	5.6	5.6
Total reduction in MBM production (million lbs/yr)	3.6	7.2	10.8
Total percentage reduction in MBM production, excl. poultry	0.1%	0.4%	0.2%
Total percentage reduction in MBM production, incl. poultry	0.0%	0.2%	0.1%
Reduction in tallow production			
Decline in tallow from PCM (million lbs/yr)	2.0	0.9	2.9
Decline in tallow from downers and deadstock (million lbs/yr)	0.0	1.5	1.5
Total tallow production (million lbs/yr)	6,634.1	2,936.5	9,570.6
Total reduction in tallow production (million lbs/yr)	2.0	2.4	4.4
Total percentage reduction in tallow production	0.0%	0.1%	0.0%
Potential declines in production as % of aggregate industry revenues			
Average historic market prices, MBM per lb.	\$0.09	\$0.09	NA
Assumed price for poultry-based feed	\$0.12	\$0.12	NA
Average historic market prices, tallow per lb.	\$0.18	\$0.18	NA
Approx. industry revenues for MBM and poultry-based feed sales	\$825,262,650	\$286,264,350	\$1,111,527,000
Approx. industry revenues for tallow sales	\$1,194,129,902	\$528,574,858	\$1,722,704,760
Reduction in MBM revenues from PCB (from Table 2-2)	\$327,549	\$146,134	\$473,682
Reduction in MBM revenues from deads, downers (from Table 2-2)	\$0	\$501,866	\$501,866
Reduction in tallow revenues from PCM (from Table 2-2)	\$360,958	\$161,039	\$521,997
Reduction in tallow revenues from deads, downers (from Table 2-2)	\$0	\$271,903	\$271,903
Combined percentage decline in revenues	0.0%	0.1%	0.1%
Total Reduction in revenues	\$688,507	\$1,080,942	\$1,769,448

Source: For total volumes of material, Sparks Companies, Inc. 2001.

Estimates of distribution between renderer categories are estimated by ERG based on Sparks Companies, Inc., 2001, and other data. Estimates of reduction in MBM production derived from material in Table 2-2.

Tallow production figures are from U.S. Census Bureau, 2003. Tallow production data is for 2002.

As mentioned in Section 2.3, the post-regulation level of dead and downer rendering will also change slightly. At present, renderers often pay feedlots and dairy farms that generate substantial numbers of animal carcasses, but will charge small ranchers, especially those located in remote areas, to pick up their dead animals.

The small loss of productive value for rendered MBM and tallow from dead and downer animals will not have a major effect on the economics of renderer pickups of dead animals. Nevertheless, some renderers might choose not to handle deads and downers because of the slight decline in their value and/or to avoid adding a digester or other processing system for PCM. This decline in the supply of rendering services could increase the price of those services. This increase in renderer pickup charges could make ranchers slightly less likely to call renderers to remove dead or downer animals. As described in Section 2.3, about 26,000 more animals are estimated to be disposed on farms as a result of the regulatory option. However, feed lots, dairy farms, and other land-constrained operations (or operations subject to effective state enforcement for animal carcass disposal) appear to have fewer options for on-site disposal (unless they are willing to pay for incinerators or other technologies) and appear most likely to pay the increased renderer charges. The loss of value to the renderers of dead and downer animals no longer collected was estimated in Table 2-6.

Because the elimination of PCM from rendering processes will generally lower the utilization rate for equipment, these percentage reductions in production levels could understate the actual reductions in profits for renderers processing non-prohibited cattle offal. The change in operating efficiency, however, is so small as to be negligible.

2.5 Rendering Capital Investments and Other Costs

A small number of renderers might add a PCM processing capability for PCM in their facilities, thereby generating some modification/renovation costs. This step is not required by the regulation and it is uncertain whether at least some renderers might be compelled to offer such disposal services to maintain their market position. ERG has assumed that the \$12 per cwt captures the direct social costs of whatever disposal methods are used by renderers or others.

Costs to separate PCM prior to disposal, however, might be incurred. Most renderers currently do not have the saws and other equipment in place to remove the skull and backbone or the brain and spinal cord from dead and downer animals. Discussions with an equipment vendor, Jarvis Products Corp., however, indicate that some renderers either have or are contemplating buying such equipment (Fulgham, 2005). Additionally, additional labor is needed to perform these tasks.

Based on discussion with Jarvis Products Corp., a major manufacturer of equipment to remove brains, spinal columns, spinal cords, and other materials during animal slaughtering or rendering processes, ERG estimates that smaller renderers (those with fewer than 20 employees) will choose to remove the entire skull and the spinal column. For this purpose they will purchase electric circular cutting saws. Larger renderers (with more than 20 employees) will remove either skulls and spinal columns or merely the brains and spinal cords, depending on whether the deadstock is fresh or not (Fulgham, 2005). (The effective removal of only the prohibited PCM materials is difficult on deadstock that are not fresh because the animal carcasses deteriorate quickly, especially in the summer months.) Adding in the cost of disposal bins and 10 percent for installation costs, as suggested by Fulgham (2005), brings the costs to \$7,265 per plant. Renderers can use their existing knives (such as are now used in de-hiding and paunch removal) for removing heads (Fulgham, 2005). The large rendering plant equipment needed is similar to

slaughterhouse equipment, such as splitters and vacuum equipment for spinal cord and brain removal. Large renderers are also forecast to buy equipment for spinal column removal for more decayed animals. Due to the numbers of such animals processed, however, they will need to purchase a hydraulic circular cutting saw. Jarvis quoted ERG a price of \$32,229 for this saw. With a 10 percent factor for installation and the inclusion of disposal bins of \$500, the total capital costs are estimated at \$35,952.

Maintenance costs are included at an assumed 10 percent of capital costs per year. Labor costs are calculated based on the assumed labor rate of \$25,588 per year (as discussed in Table 2-3) and assuming that workers can separate the PCM from renderable material in 10 minutes per animal (Bisplinghoff, 2005b). Additional time to bring the PCM materials to an in-plant disposal bin is also included and is calculated similarly to that for slaughterers (see Table 2-3).

Table 2-9 presents the costs for renderers to meet the requirements of the regulatory option using the above costs and assumptions. The number of renderers estimated to handle dead and downers is estimated at 141 based on the number of independent renderers in the FDA inspection database (Battaller, 2004).² ERG estimated the average number of deads and downers processed daily at each size plant based on discussions with Bisplinghoff (2005b). He indicated that the very largest plants could process as much as 200 head a day, and that an average plant would process roughly 100 head/day. ERG then estimated the number of head processed in the remaining size categories on the basis of relative employment figures and the assumed efficiencies in processing to arrive at rendering quantity estimates that approximately match the aggregate processing figures shown in Table 2-2. (The estimates account for the reductions in the number of animals picked up as a result of the regulatory option).

As Table 2-9 shows, the annualized costs total \$1.9 million. Some portion of this cost might be passed back to farmers in the form of additional fees to collect dead and downers, but for this calculation it is assumed that renderers bear the total cost of meeting PCM requirements.

² Other estimates of the number of independent renderers exist such as those offered by Bisplinghoff (2005a) and Auvermann, et al, 2004, but all estimates are within approximately 10 percent of the others.

Table 2-9. Capital and O&M Costs for Renderers to Meet PCM Removal Requirements

Employment Size	Number of Plants (a)	Average D&D pickups per day (b)	Capital Cost (c)	Aggregate Capital Cost	Annualized Capital Cost (d)	Maintenance @ 10% of Capital Costs (e)	Additional Staff per Facility (f)	Incremental Payroll Per Facility (g)	Aggregate Incremental Payroll	Aggregate Annual Cost	Total Head (h)	Cost/Head
1 to 4	24	1	\$7,265	\$ 174,360	\$ 24,825	\$ 2,482	0.04	\$ 1,066	\$ 25,588	\$ 52,895	7,371	\$7.18
5 to 9	20	3	\$7,265	\$ 145,300	\$ 20,687	\$ 2,069	0.08	\$ 2,132	\$ 42,647	\$ 65,403	18,018	\$3.63
10 to 19	32	7	\$7,265	\$ 232,480	\$ 33,100	\$ 3,310	0.17	\$ 4,265	\$ 136,469	\$ 172,879	70,707	\$2.45
20 to 49	36	16	\$35,952	\$1,294,268	\$ 184,275	\$ 18,427	0.35	\$ 9,062	\$ 326,247	\$ 528,949	157,248	\$3.36
50 to 99	23	40	\$35,952	\$ 826,894	\$ 117,731	\$ 11,773	0.90	\$ 22,923	\$ 527,219	\$ 656,724	251,160	\$2.61
100+	6	100	\$71,904	\$ 431,423	\$ 61,425	\$ 6,142	2.21	\$ 56,507	\$ 339,041	\$ 406,608	245,700	\$1.65
Total	141			\$3,104,725	\$ 442,043	\$ 44,204			\$1,397,211	\$1,883,459	750,204	\$2.51

(a) Based on 2002 Census data and assuming that 80 percent of plants with fewer than 20 employees and 30 to 50 percent of plants with 20 employees or more are independent renderers and pick up deadstock. Percentages based on information from Bisplinghoff and ERG estimates using a target of about 141 independent renderers, based on the count of renderers in FDA's inspection data base (Battaller, 2004).

(b) See discussion in text.

(c) From Jarvis Products Corp. (Fulgham, 2005).

(d) Annualized at a 7 percent discount rate over 10 years.

(e) ERG assumption.

(f) See discussion in text and footnotes in Table 2-3.

(g) Based on labor rate shown in Table 2-3. It is assumed that the skills of laborers such as those found in the slaughter industry will be required for PCM removal.

(h) Estimated using the average number of daily pickups over a 273-day work year. Roughly matches number of head calculated in Table 2-2.

2.6 Cost Implications of Removal of Prohibited Materials Prior to the Mechanical Separation of Beef

Renderers and other dead animal, or “4D,” firms³ collect dead and downer cattle and carve the carcasses to yield red meat for the pet food manufacturers, zoos, greyhound dog track operators and other animal feeding operations. Typically the 4D firms perform rough deboning by hand and remove the choicest and most accessible cuts of meat. Some of the facilities also use mechanical separation equipment to produce additional meat for pet food manufacturers.

Based on discussions with industry executives, ERG estimates that there are roughly twenty firms engaged in red meat and MS beef production, divided equally between renderers and non-rendering companies. The latter firms collect dead animals and provide carcasses directly to pet food manufacturers. They might also provide animal offal to rendering facilities.

The 4D firms appear to be the only firms using MS systems. Slaughterers have largely discontinued use of mechanical separation systems for beef production due to regulatory pressure. The 4D firms still use the equipment in some operations. The US Department of Agriculture Food Safety and Inspection Service (FSIS) first required labeling of MS beef, which discouraged MS beef production by most meat packers. FSIS then banned MS beef from human consumption. FSIS representatives stated that there was very little impact on slaughterers from the FSIS ban on MS beef from human consumption because so little was being produced (Perrata, 2004 and Payne, 2004). Pet food manufacturers have also been decreasing their purchases of MS beef from 4D plants in recent years. Many renderers have noted that pet food companies, and particularly the large name-brand producers, are sensitive to public perception about pet food inputs.

Although there appear to be no published or widely accepted figures on the size of the 4D industry, one industry executive estimated the total market for red meat, including MS beef, from 4D animals was \$90 million per year. A second contact judged that revenues were more than \$90 million per year but could not give a precise estimate. For the purposes of estimating economic impacts, ERG assumed a total market size of \$100 million per year. (The industry sales are too small or not distinguished from other materials sufficiently to be covered in Census figure data for either renderer sales or pet food manufacturer purchases of feed.) ERG judges that most of this value is generated from the red meat (carved by hand) and MS beef sold to pet food firms and other animal feeding operations. The total share of production from MS beef has declined considerably over the last several years, and now represents roughly 20 to 25 percent of red meat production for 4D firms. The remainder of the value is generated by the red meat removed from the carcasses. ERG assumed that industry generates 25 percent of its value by collecting animals for rendering.

If the draft regulation is implemented, 4D firms using mechanical separation will need to remove brain and spinal cord prior to separation. According to industry experts (Bisplinghoff, 2005a; Harlan 2005), due to customer preferences, the industry is already removing these materials prior

³ The term refers to dead, dying, diseased, and disabled cattle.

to mechanical separation. Thus no impacts on this segment of the industry are projected, based on the current version of the regulation.

2.7 PCM Marking Costs

FDA is also requiring renderers of PCM to mark the resulting product to help ensure it will not be used as feed. Thus renderers will need to add some type of identifying material to processed PCM in addition to the labeling requirements.

No markings are currently being used in US industry and FDA has not yet specified the marking techniques and their associated technical requirements. ERG has assumed that the markings will need to be environmentally compatible and readily evident. ERG also assumed that marking material will be added at the end of the rendering process.

No estimates were identified of the costs for U.S. renderers to mark their PCM outputs. One cost estimate for a very small UK slaughterer (four employees) estimated his annual dye expenses for marking prohibited offal at 500 British pounds or roughly \$950 per year (allowing for \$1.90 per British pound, based on approximate exchange rates in August 2004) (Farmers Journal, 2004).

Fluorescent dyes, such as those used in tracing water plumes and other environmental study purposes, are sold through various chemical supplies, such as Lab Safety Supply. The 2004 Lab Safety Supply catalogue lists several tracing dyes. These include dyes of different colors, environmental characteristics, solubility, and other characteristics. The prices vary from \$85 to \$154 per gallon (Lab Safety Supply, 2004). Renderers would presumably enter into long-term bulk order purchase contracts at prices per gallon considerably below those shown in the catalogue. The marker dyes are generally used in dilution. For example, one source indicates that Patent Blue V dye (a violet-colored dye that is frequently mentioned as a possible marker) would be diluted to a 0.5 percent solution, i.e., diluted by a factor of 200 (British Poultry Council, 2004).

Lacking precise information or industry experience with marking dyes, ERG used a range of assumptions to characterize the cost of adding marker dyes to rendered PCMs. Assuming purchase prices for dyes of \$85 to \$156 per gallon, dilution by factors of 100 to 200, application rates of one quart to one-half gallon of diluted dye per ton of rendered PCM, and applying the assumptions so as to generate the widest possible cost range, the cost per ton of rendered PCM would vary from less than \$0.11 to \$0.78 per ton (see Table 2-10). ERG uses the rendered weight of all PCM estimated to be generated annually as an upper bound estimate of the quantity of PCM that might need marking, although it is likely that not all PCM will be rendered.

Table 2-10. Prohibited Materials Marking Costs for Renderers

Cost Component	Low Estimate	High Estimate
Cost per gallon	\$85	\$156
Dilution factor	200	100
Cost per diluted gallon	\$0.43	\$1.56
Application rate (gallons) per ton of PCM	0.25	0.50
Cost per ton of PCM	\$0.1063	\$0.7820
Total cost of marking (for total weight lost to rendering in Table 2-6)	\$1,708	\$12,574

Sources: Lab Safety Supply, 2004; British Poultry Council, 2004; and ERG estimates

2.8 Recordkeeping and Labeling Costs

The proposed FDA regulation requires all renderers handling cattle materials to keep records and label their products. Renderers handling prohibited bovine materials are required to establish and maintain records tracking the PCM to ensure they are not used in animal feed. These renderers are also required to label the products as inappropriate for animal food. Renderers of cattle materials other than PCM are required to keep records and appropriately label products to demonstrate that they do not contain prohibited bovine materials.

To estimate recordkeeping costs for these requirements, ERG made certain assumptions about the number of renderers affected. ERG assumed all these renderers are affected by the recordkeeping and labeling requirements, although some might not handle PCM. Since they are likely to modify their non-ruminant material labels, however, those choosing not to handle PCM will still be affected by the proposal.

Recordkeeping requirements for renderers handling PCM are most likely to be addressed by records of PCM pickups and PCM disposal records. Renderers currently keep records of sales and disposals and hence, incremental recordkeeping costs associated with ensuring that animal feed is free of PCM will be modest. Similarly, recordkeeping requirements for renderers handling only non-prohibited cattle material will be also minimal. Most such facilities already collect records demonstrating the source of the cattle materials such as purchasing and receiving records.

In evaluating compliance costs, ERG has noted the enhancement in industry recordkeeping practices mandated by the 1997 feed rule. Hence, renderers already must properly record and label shipments. For this regulation, only modest incremental recordkeeping costs are anticipated for the supplemental recordkeeping. Recordkeeping costs are estimated for an initial modification of procedures, as well as a quarterly review and filing of records to ensure that they are sufficient to meet the requirements of the rule. ERG judged that an initial process modification will require 15 hours of labor, while the quarterly record review and filing will require 5 hours per quarter.

To convert the labor estimates to costs, ERG used the mean hourly wage for office and administrative support occupations within the animal slaughtering and processing industry from BLS's Occupational Employment Survey. This hourly estimate was then increased by 40 percent to account for fringe benefits. Using the resulting labor rate of \$17, recordkeeping requirements

for renderers handling prohibited bovine materials is estimated to be \$256 per facility for the first year and \$85 per facility for the following years (see Table 2-11).

As with the recordkeeping requirements, incremental labeling requirements of the proposed regulation are also deemed to be minimal. Renderers currently label their products and/or invoices and hence, any additional labeling requirement will not create significant costs. For this analysis, ERG estimated incremental labeling costs for the one-time initial design, production, and filing of a label or invoice. ERG judged incremental labeling time estimates to include 2 hours of management time (estimated at \$52.86 per hour, as derived from the BLS and loaded) and one hour of clerical labor time (at \$17 per hour) per facility. Per facility labeling design and review costs are estimated at \$123 (see Table 2-10). Incremental printing or paper costs for the labels or invoices are judged to be negligible.

Table 2-11: Recordkeeping and Labeling Costs of the Ban on Prohibited Materials

Cost Component	Value
Clerical wage rate: Loaded wage rate for all office and administrative support occupations in animal slaughtering and processing industries	\$17
Management wage rate: Loaded wage rate for all management occupations in animal slaughtering and processing industries	\$53
Recordkeeping requirements	
Initial modification of procedures	
Hours needed for modification	15
Cost of modification (using clerical wage rate)	\$256
Quarterly review and filing of records	
Hours needed for quarterly review	5
Cost of quarterly review and filing (using clerical wage rate)	\$85
Set-up recordkeeping costs per facility	\$595
Recurring annual recordkeeping costs per facility	\$340
Labeling requirements	
Design of label or invoice	
Hours needed for design	2
Cost of design (using management wage rate)	\$106
Production and filing of label or invoice	
Hours needed for review	1
Cost of production and filing (using clerical wage rate)	\$17
Set-up labeling costs per facility	\$123
Total set-up costs for all affected rendering facilities	\$101,238
Recurring annual costs for all affected rendering facilities	\$47,940
Annualized costs for all rendering facilities (a)	\$62,354

(a) Costs are annualized at a 7 percent discount rate over 10 years.

Source: BLS, 2004 and ERG estimates. Aggregate totals based on number of establishments reporting in current FDA database (141).

Note: Totals might not sum due to rounding.

As shown in Table 2-11, total recordkeeping and labeling costs for all rendering facilities are estimated to be \$101,000 for the first year and \$48,000 each subsequent year.

2.9 Costs of Incremental Restrictions on Tallow

The tallow impurity restriction in this regulatory option is consistent with recent industry trends toward lowering tallow impurity levels. (This stipulation applies to tallow from non-prohibited materials; PCM-based tallow is entirely prohibited from animal feed under the present option). Thus, FDA's requirement that tallow used for animal feed contain no more than 0.15 percent hexane-insoluble impurities is consistent with common customer specifications for inedible tallow. For example, many renderers' fatty acid customers and export market customers require impurity levels consistent with the FDA requirement. The producers of edible tallow for use in food products, mostly packer/renderers, meet tighter impurity specifications (i.e., 0.05 percent impurities).

The December 2003 discovery of a BSE-diseased cow in Washington State, and increased quality control demands from their customers, gave considerable new impetus to renderers' efforts to reduce the impurity levels. Estimates by rendering industry executives and equipment vendors vary on the exact extent to which renderers have installed or will soon install the equipment needed to reduce impurities. Nevertheless, a number of executives judged that a majority of renderers are probably now achieving impurity limits consistent with this FDA regulatory option. The remaining independent renderers are most likely to be supplying local feedlots and might have insufficient incentive to reduce impurities thus far.

Thus, the FDA requirement further encourages an industry trend for inedible tallow producers toward reducing impurities, but some renderers are not yet in a position to meet the tighter requirements. Thus, ERG judged that the FDA regulation, if imposed within the next year, would generate incremental costs for some inedible tallow manufacturers among independent renderers.

Using the FDA inspection database, there are an estimated 141 independent renderers. Based on discussions with industry executives and equipment vendors, ERG estimated that roughly one-third of these (50 establishments) lack necessary equipment to achieve the impurity requirements for tallow. Many plants have decanter centrifuge systems to remove larger chunks of material but still need polishing centrifuges to remove additional impurities.

Polishing centrifuges range in installed cost from \$75,000 to as high as \$500,000 for the most sophisticated and large-capacity units (Barlagi, 2004). Another vendor estimated that many centrifuges are sold in the \$90,000 to \$165,000 range (Hensley, 2004). For the rendering facilities, ERG used the mid-point of the second cost range of \$128,000, and added a 25 percent allowance for installation and engineering costs. ERG calculated that annualized capital costs are \$22,800 per year (at 7 percent per year over 10 years). ERG also assumed that operating costs are equal to 10 percent of the equipment costs and thus amount to \$12,800 per year.

Small rendering facilities have some technical potential to achieve the tightened impurity levels by installing less expensive filtering equipment. Such systems generate higher operating costs, however, because plant workers must periodically clean or replace the impurity filters. Thus, such systems were mentioned as a possibility but appeared to have uncertain viability given their operating costs and technical limitations. Also, many small renderers have been investing in

centrifuge systems because they are among the firms particularly dependent upon tallow export markets where impurity concerns have been of particular concern. Thus, ERG assumed that all affected renderers would upgrade to centrifuge systems.

The total operating and annualized capital costs per year across all facilities adding equipment (50 plants) are estimated at \$1.8 million per year. If costs are annualized at 3 percent per year, the total costs for this requirement are \$1.6 million per year.

2.10 Summary of Costs

Table 2-12 presents the costs of the various costs that will affect slaughterers, renderers or farmers as a result of the regulatory option investigated here. The total cost of the option is estimated to be \$16.3 million per year.

Table 2-12. Summary of Costs

Cost Component	Cost
Capital and O&M costs for slaughterers to remove PCM	\$675,601
Lost MBM and tallow values of PCM	\$1,769,448
Lost MBM and tallow values of disposed deads and downers	\$1,006,236
Capital and O&M costs for renderers to remove PCM	\$1,883,459
Costs of tallow impurity restrictions	\$1,779,020
Recordkeeping and labeling	\$62,354
PCM marking (maximum)	\$12,574
Dead and downer disposal costs to farmers	\$1,022,633
Disposal costs for PCM (renderers and slaughterers)	\$7,718,072
Total	\$15,929,397

SECTION THREE

FINANCIAL IMPACTS ON AFFECTED INDUSTRIES AND AGRICULTURAL SECTORS

This section presents regulatory impacts of FDA’s proposal to prohibit the use of brains, spinal cords, and other materials from certain classes of cattle. The prohibition of PCMs will primarily affect animal slaughterers (NAICS 311611) and renderers (NAICS 311613). Several other industries will also be affected if the draft regulatory language is promulgated, including farming operations.

Section 3.1 addresses Small Business Regulatory Enforcement Fairness Act (SBREFA) requirements for the NAICS industries mentioned above. Section 3.2 presents the financial impact model framework used to estimate impacts on these industries while Section 3.3 presents the financial impacts for the NAICS industries mentioned above. Section 3.4 briefly discusses impacts on farming, “4D” firms, and contrasts this option with the impacts of alternative options. Finally, ERG uses a market model to present market impacts as a result of the PCM prohibition in Section 3.5.

3.1 Number of Establishments

Table 3-1 shows the total number of establishments in the NAICS industries affected by the draft proposed requirements of the regulation. The establishments are distributed by employment size group, as reported by the Census Bureau’s *2001 County Business Patterns*. The large majority of establishments in both the slaughtering and rendering industries employ fewer than 100 workers.

The table also shows the number of affected establishments in both the slaughtering and rendering industries. For slaughterers (NAICS 311611), ERG assumed that all beef slaughterers would be affected by PCM requirements. ERG used data on the number of federally inspected slaughter plants by number of head slaughtered to find the number of affected establishments. ERG matched Census’s employment based size groups with USDA’s number of head based size groups.

Renderers will be impacted by three separate requirements in the draft regulation. These include increased purity restrictions on tallow, recordkeeping and labeling requirements, and PCM marking requirements. In addition, renderers will lose revenues from dead and downer cattle that will not be available and the MBM and tallow production from the PCM itself. They will also face some operating and capital costs to remove and dispose of PCM. Of the 228 renderers in NAICS 311613, ERG assumed that the increased restrictions on tallow would affect 50 cattle renderers who have not yet upgraded their separating equipment. ERG also estimated that 141 renderers handle cattle materials and will be affected by the recordkeeping, labeling, and other requirements. The affected renderer establishments were then allocated to the employment size classes using each size class’s share of the total number of establishments.

Table 3-1. Number and Size Distribution of Establishments Affected by the PCM Alternative

Employment Size Group	NAICS 311611 (Slaughterers)		NAICS 311613 (Renderers)		
	Total Number of Estab.	Number of Affected Estab.	Total Number of Estab.	Number of Estab. Affected by Tallow Restrictions	Number of Estab. Affected by All Other Requirements
1 to 4	1,035	508	32	7	20
5 to 9	428	89	20	4	12
10 to 19	243	26	50	11	31
20 to 49	164	11	65	14	40
50 to 99	77	12	47	10	29
100 to 249	57	8	12	3	7
250 to 499	38	11	2	0	1
500 to 999	13	9	0	0	0
1,000 to 2,499	56	13	0	0	0
More than 2,500	0	2	0	0	0
Total	2,111	689	228	50	141

Sources: USDA, 2004; U.S. Census Bureau 2004.

For the economic and SBREFA analysis, ERG notes that the large majority of entities (that is, firms rather than establishments) in both slaughtering and rendering are small according to the Small Business Administration (SBA) definition, i.e., employing fewer than 500 workers (SBA, 2004a). In slaughtering, 1,970 of 2,014 entities are small. In rendering, 96 of 122 entities are small (SBA, 2004b). Nevertheless, ERG's economic impact analysis is designed to assess impacts on small establishments. The facility closure decisions will be made primarily at the establishment level, whether or not the establishment is a stand-alone business or part of a larger entity. These results, in turn, help define impacts on small and large entities.

3.2 ERG's SBIM© Model

ERG used its Small Business Impacts Model (SBIM©) to estimate financial impacts of a PCM ban. The SBIM© model has been developed previously for the analysis of EPA and FDA regulated industries (ERG, 2002). This model allows ERG to evaluate financial impacts on establishments by employment size group, as well as to predict business closures using alternative income specifications, such as cash flow, net income, earnings before interest and taxes (EBIT), and revenues. For more detail about the SBIM© model see Section 4 and Appendix A of the July 2005 Final Report on regulatory alternatives.

3.2.1 Impact Methodology

3.2.1.1 Impacts on Net Income

Impacts on net income are estimated by measuring the pre- and post-regulatory net income of the average establishment in each employment size group. If net income becomes negative after regulatory costs are subtracted from an establishment's pre-regulatory net income, it can be reasonably inferred that closure was a result of the regulatory cost burden.⁴

ERG used Census data to estimate average establishment net income by employment size group for the relevant NAICS industries. The *1997 Economic Census: Manufacturing – Industry Series* data provide detailed revenue (shipments) and operating cost information by employment size group and additional cost information at the industry level. ERG then calculated net income per establishment for each employment size group using additional assumptions to estimate tax and interest payments. See Appendix A of the October 11, 2004 Draft Final Report for more detail on the net income estimation methodology.

3.2.1.2 Incremental Closure Impacts

ERG's strategy for assessing establishment net income closure impacts compares pre-regulatory net income with post-regulatory net income. Presumably an establishment might close if regulatory costs cause net income to change from being positive to negative.

Net income for a given group of establishments within a size group will lie in a distribution around the average; some establishments will have smaller and some will have larger incomes. To incorporate this into the model framework, ERG estimated the distribution of net income among establishments in each size group. By modeling an establishment's income distribution using an estimated mean and variance, the model projects how compliance costs impact not just the model establishment in a size group, but the range of establishments it represents.

To estimate the distribution of income, ERG obtained special tabulations of the variances and covariances of relevant income components for each employment size group from the Census Bureau (U.S. Census Bureau, 2004 and 2001). Combining these data along with the assumption that the income components are normally distributed around their mean, ERG constructed cumulative probability distributions for revenues, and net income.

⁴ The effect of the regulation on facilities with negative net income in the baseline ("baseline closures") cannot be evaluated. The basis for determining the impact of a potential regulation on an establishment is that the establishment must have positive earnings prior to the regulation and negative earnings after regulation. If an establishment has negative earnings prior to the regulation, then it may very well close even if the regulation is never promulgated. Thus, closure of such an establishment should not be considered an impact of the regulation.

3.3 Financial Impacts of an PCM Ban on Slaughterers and Renderers

This portion of the analysis assumes that no regulatory costs will be passed through to consumers. Hence, the impacts presented describe a worst-case scenario for the affected establishments. Although it is hard to predict, the industries will eventually pass on much of the incurred costs. For instance, slaughterers may pass costs backward to animal producers and forward to consumers. Nevertheless, it is instructive to examine impacts before cost pass-through is considered.

The draft standard prohibits the use of PCMs and tallow with more than 0.15 percent hexane insoluble impurities. A PCM ban would require slaughterers to remove PCM at the time of slaughter and arrange for the disposal of the material. Slaughterers would face incremental costs for investments in modifications to the kill floor, changes in the transport of animal byproducts through the slaughtering facility and to the disposal or disposal/rendering operation, and changes in the labor operations during slaughtering.

Table 3-2 shows net income and closure impacts on slaughterers (NAICS 311611). Costs are allocated to each employment size group based on share of total slaughter. As can be seen from the table, net income impacts on slaughterers range from 0.3 percent of net income for establishments with 1 to 4 employees to 8.8 percent of net income for the establishments with 10 to 19 employees. The incremental probability of closure varies from 0.05 to 1.3 percent. Given these assumptions, there is a statistical probability that one establishment will close.

For some size classes, closures might appear to be low relative to the estimated compliance costs. This is because the tables show incremental closures and do not include baseline closures, i.e. establishments where pre-regulatory income is negative. Further, these closures assume there is no cost pass-through. As shown in the market model below, considerable cost pass-through should be expected.

Restrictions on tallow used in animal food would adversely impact independent renderers. They would need to purchase and install polishing centrifuge systems that would allow the tallow produced to contain less than 0.15 percent hexane insoluble impurities. Renderers would also face incremental annual costs for recordkeeping and labeling and costs for marking rendered products to ensure they are not used in animal feed.

Renderers (and particularly independent renderers) are also likely to incur some adverse impacts due to PCM disposal requirements. Renderers will see a reduction in the volume of renderable raw material, as described in Table 2-8. The reduction in MBM and tallow production from the loss of PCM from the supply chain and decline in the availability of dead and downer cattle reduces aggregate renderers revenues by \$1.1 million and integrated packer/renderers by \$689,000.

Table 3-3 presents renderer impacts as a result of increased costs to meet the tallow restrictions, fulfill incremental recordkeeping requirements, and satisfy marking requirements for PCM-derived derived materials and revenue losses. Annual costs for these requirements from Section 2 were allocated to affected establishments in employment size groups on the basis of their share of value of shipments.

Financial impacts range from 3.3 percent of net income for establishments with 1 to 4 employees to 8.3 percent of net income for establishments with 50 to 99 employees. Statistically, one establishment is projected to close as a result of these requirements with the incremental probability of closure (i.e. compliance cost greater than net income) ranging from 0.6 percent to 1.6 percent.

As previously noted, the renderer impacts were calculated using 1997 Census of Manufactures figures. The 2002 Census for renderers is available but has not been applied to ensure this analysis is consistent with earlier documents.

3.4 Impacts on Other Sectors and Alternative Options

The draft regulatory language will also affect farming operations and “4D” firms. Impacts on these firms are discussed below.

Farming operations will also be affected by the proposed regulation because they will incur incremental costs for disposing dead and downer cattle. With the prohibition of MBM from PCM in animal feed, the number of deads and downers being rendered for disposal will decline slightly and the amount of material from each animal will also decline. Some animal operations will dispose of their deads and downers on-site and will incur incremental costs for these disposals. The significance of these costs will vary with the scale of the animal operation but are a very small component of operating costs in any case. ERG estimates these disposal costs may amount to \$1.0 million nationwide but judges that these incremental charges are so widely distributed as to have negligible effect on the probability of farm closures.

Table 3-3. Net Income and Closure Impacts on Renderers

Employment Size Group	Number of Affected Estab. [1]	Net Income per Estab. in \$1,000 [2]	Net Income Standard Deviation [3]	Impact Estimate			
				Compliance Costs per Affected Estab. in \$1,000 [4]	Costs as a Percent of Net Income	Incremental Probability Net Income Less than Costs [5]	Number of Estab. with Costs Greater than Net Income [6]
1 to 4	20	\$159.0	331	\$5.2	3.3%	0.6%	0.1
5 to 9	12	\$542.8	845	\$40.8	7.5%	1.6%	0.2
10 to 19	31	\$647.7	1115	\$36.9	5.7%	1.1%	0.3
20 to 49	40	\$2,001.1	3406	\$103.7	5.2%	1.0%	0.4
50 to 99	38	\$1,937.7	4767	\$160.8	8.3%	1.3%	0.4
100 to 249	0	NA	-	\$0.0	NA	NA	NA
250 to 499	0	NA	-	\$0.0	NA	NA	NA
500 to 999	0	NA	-	\$0.0	NA	NA	NA
1,000 to 2,499	0	NA	-	\$0.0	NA	NA	NA
More than 2,500	0	NA	-	\$0.0	NA	NA	NA
Total	141	NA	NA	NA	NA	NA	1.4

[1] 50 establishments are assumed to be affected by the tallow purification standard.

[2] 1997 Economic Census data used to estimate net income. The Bureau of Labor Statistics' Consumer Price Index is used to convert the income measures to current dollars.

[3] The standard deviation of the net income statistic is calculated for the special tabulation provided by Census (see text).

[4] Total annual compliance cost is allocated to each size group based on the share of value of shipments.

[5] Probability net income less than compliance costs minus probability net income less than zero.

[6] Probability net income less than costs times the number of establishments.

[7] Data for 7 facilities with employment between 100 and 249 and 1 facility with employment between 250 and 499 are combined in lower category due to disclosure issues.

Sources: BLS, 2004; U.S. Census Bureau 1999; U.S. Census Bureau, 2001; U.S. Census Bureau, 2004.

4D firms collect dead and downer cattle and either supply red meat or entire animals to the pet food industry. Some firms perform rough manual deboning of cattle and might also supply mechanically separated (MS) beef to the industry. The estimated 20 4D firms already remove the brain and spinal cord before mechanical separation to comply with customer preferences. As discussed in Section 2.6, no impacts on this segment of the industry are projected.

Alternative regulatory requirements considered by FDA in earlier phases of this rule-making had significant effects on animal producers, feed mills, and farm operations. Prohibiting the use of cattle blood meal in ruminant feed would have driven several user groups to seek out alternative sources and increased their costs. In addition, the need to render a substantial quantity of material that could not be used in feeds in facilities dedicated to handling only this material implied establishment of a new industry and new facilities. The current proposal greatly reduces the amount of material to be quarantined and permits the use of blood meal in ruminant feeds. These changes obviate the impacts on feedmills and the new dedicated processing industry.

3.5 Market Level Impacts of the PCM Rule

ERG used a market model to examine the impacts of the PCM rule on the overall price and output of beef as well as on consumers, slaughterers, and cattle producers. ERG developed the basic framework for this market model to assess the impacts of EPA's meat products industry effluent guidelines, and modified it for use on this rule.

The model simultaneously estimates the perfectly competitive equilibrium price and output in four meat product markets (beef, pork, broilers, and turkey) at the wholesale level. The four markets are modeled simultaneously because these meat products are substitutes. Consumers will tend to respond to an increase in the price of beef by increasing their purchases of the other three products. If these substitution effects are ignored, the impacts of the rule on the market for beef are likely to be underestimated. For each of the four meat products, ERG developed standard domestic supply, domestic demand, import supply, and export demand equations for each meat and poultry product. Domestic demand for each meat and poultry product is specified as a function of the price of the other three meat and poultry products in addition to its own price. ERG used USDA data to determine baseline market prices and quantities. Key model parameters (e.g., price elasticities) were selected from existing published sources after an extensive search. For each meat and poultry product market to be in equilibrium, U.S. domestic demand plus foreign demand (exports) must equal U.S. domestic supply plus foreign sales (imports) at its current market price. Further details on the market model may be found in Appendix B of the October 11, 2004 Draft Final Report.

In order for beef slaughter facilities to be willing to supply exactly the same quantity of beef after the PCM rule as before the PCM rule, they will need to recoup the additional costs incurred as a result of the rule; these costs will be spread over all units sold. Therefore, ERG models the decrease in supply of beef resulting from the PCM rule as the annualized compliance costs per pound of carcass weight. Given the shift in the supply curve for beef, ERG solves for the post-regulatory set of meat prices that results in simultaneous equilibrium in all four markets.

The results of the market model analysis are summarized in Table 3-4. For each of the four markets, ERG presents the initial market equilibrium price and quantity, and the percent change in each of those variables resulting from the effects of the PCM rule on beef. In addition, within the beef industry, ERG further examined impacts on consumers, processors, and cattle suppliers.

Drawing from the costs shown for slaughterers in Table 2-7, and lost revenues in Table 2-8, compliance costs of the PCM rule are \$0.00036 per pound (wholesale weight). This will result in a price increase of 0.03 percent in the price of beef, and a 0.01 percent decrease in domestic beef consumption. Consumers may substitute pork and poultry for the now relatively more expensive beef, but these impacts are very small; sales of pork and poultry products are projected to increase by less than 0.01 percent.

ERG used a simplified fixed coefficient model of the derived demand for cattle in order to examine differential impacts on consumers, slaughterers, and cattle producers. Based on the ratio of beef production to cattle slaughter in 2003 and standard USDA ratios for determining wholesale and retail production, ERG determined that each slaughtered steer results in about 587 pounds of marketable beef (wholesale weight). Thus, for each 587 pound decrease in beef sales projected by the market model, ERG assumes cattle slaughter decreases by one. The 1.7 million pound reduction in beef is therefore expected to reduce cattle slaughter by 2,900 head. The reduction in demand for cattle reduces the price of cattle by about 0.01 percent. (These estimates do not include a forecast of the cost increase to farmers from the change in the economics of dead animal removal.)

The farm-to-wholesale price margin is also slightly reduced by the PCM rule. The price that processors receive after paying the incremental costs imposed by the PCM rule is projected to fall by about 0.01 percent. However, the processors' farm-to-wholesale margin falls by a smaller amount because they pay less for cattle. Thus, the net decrease in the processors' margin is less than 0.01 percent.

The market model results can be used to estimate the burden of the PCM rule on stakeholders. ERG estimates that about 50 percent of compliance costs will be passed on to consumers in the form of higher beef prices. Cattle producers will incur about 38 percent of compliance costs in the form of reduced cattle prices. Finally, processors will bear about 12 percent of the rule's burden in the form of squeezed price margins.⁵

⁵ Because the wholesale-to-farm price margin is not calculated as an integral component of the market model, the uncertainty associated with impact estimates on processors is greater than that for consumers and cattle processors.

Table 3-4. Impact of PCM Rule on Markets for Meat and Poultry Products

Variable	Baseline	With PCM Rule
Beef Market		
Compliance costs (\$ millions)	NA	\$7.6
Compliance costs/lb	NA	\$0.00036
As percent of price		0.03%
Consumers		
Market price	\$1,4324	\$1,4326
Percent change		0.01%
Market sales (million pounds)	21,198	21,196.4
Percent change		-0.01%
Processors		
Farm-to-wholesale price margin	\$0.4160	\$0.4160
Percent change		0.00%
Cattle Producers		
Market price	\$1,035.27	\$1,035.19
Percent change		-0.01%
Market sales (thousand head)	35,454	35,451.2
Percent change		-0.01%
Pork Market		
Market price	\$1.0064	\$1.0064
Percent change		0.00%
Market sales (million pounds)	14,630	14,630
Percent change		0.00%
Broilers Market		
Market price	\$0.6198	\$0.6198
Percent change		0.00%
Market sales (million pounds)	27,822	27,822
Percent change		0.00%
Turkey Market		
Market price	\$0.6208	\$0.6208
Percent change		0.00%
Market sales (million pounds)	5,168	5,168
Percent change		0.00%

Source: ERG meat products market model.

SECTION FOUR

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