APPENDIX B

UNIT COST ANALYSES

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APPENDIX B

UNIT COST ANALYSES

EPA developed unit cost estimates for the new steam electric generators and new manufacturers expected to begin operation during the next 20 years. For a detailed discussion on how the new generators and the new manufacturing SIC codes were selected please refer to Chapter 5 of this document The characteristics of the new facilities were determined for the new steam electric database from the information provided in the NewGen database or for the new manufacturers by analyzing similar SIC code facility data from EPA Screener Survey database. The following provides a detailed discussion on how the characteristics of the projected manufacturers were determined and how unit costs were assigned.

To determine if these facilities must take compliance actions to meet the proposed requirements, EPA needed to estimate the likely characteristics of these new facilities. Important characteristics in assessing facility compliance with New Facility Rule requirements and determining estimated compliance costs include: source water body type, intake flow volume, use of once-through or recirculating cooling systems, intake location (e.g., shoreline, offshore submerged), and in-place intake control technologies.

In order to determine the characteristics of the new manufacturing facilities that are projected to come online over the next 20 years, EPA performed an analysis of the *Industry Screener Questionnaire: Phase I Cooling Water Intake Structures*. In 1999, EPA administered a screener questionnaire to manufacturers and non-utilities. The screener questionnaire was intended to identify facilities that are subject to standards under Sections 301 or 306 and are point source dischargers under a number of industrial categories to identify the facilities that operate cooling water intake structures in surface waters and are therefore subject to Section 316(b). The survey requests information on whether the facility is a point source discharger; directly withdraws cooling water from surface water sources; the water body types upon which cooling water is being withdrawn; design intake flow for a typical operational year; type of cooling water systems in use; configuration of cooling water intake structures; technology types being used at cooling water intake structures; gross annual electricity generated; annual sales of electricity ownership type; number of full-time equivalent employees; and annual sales revenue.

Using the Screener data for a given SIC code, EPA determined the projected facility's characteristics such as originating surface water sources, flow rates, profile of cooling water systems, configuration of intake structures, and control technologies by analyzing the trends of an industry to have particular characteristics. Since facilities with the same SIC code generally have similar operations and generate similar products, EPA assumed that the characteristics of new facilities in a given SIC code will be the same as the characteristics of existing facilities in that same SIC code. EPA also considered current trends in facilities that have come online in more recent years. For example, a review of available data for facilities starting up in the last 10 years indicates that newer facilities are much more likely to have at least partially recirculating cooling systems than older facilities. In situations where a particular trend was not as definable, EPA assumed the national trends such as recirculating systems, use of screens, etc., would be the projected characteristic.

EPA evaluated the characteristics listed above for all the existing facilities in each SIC code, and used those characteristics to project the characteristics for the one or more projected new facilities. If only one new facility was projected for a given SIC code, EPA generally used the following conventions:

- Source water type: most common water body among the existing facilities;
- Flow[1]: weighted median[2] flow either by source water type, cooling system type or all flow for the SIC code;
- Intake location: most common intake location among existing facilities;

[1]Several flow values are presented in the tables. They include: Flow in gallons per day (GPD) (from screener survey data), Flow in gallons per minute (gpm), Total Flow Requirement (the total water for a facility required to circulate through the cooling systems), Flow Needed for Recirculating Cooling Towers (this is the volume of water required to recirculate through the cooling towers used to cost the towers), and Flow Used for Costing Activities Other Than Cooling Tower (this is the volume of water through the intake structure used to cost intake technologies).

[2]The Screener Survey was sent to a sample of the manufacturing facilities that may be impacted by the rule. A statistical weight was applied to the responses to represent the impacted universe.

- Control technology type: most common technologies in use at existing facilities; and
- Cooling system type: most common type, with a bias toward recirculating or combined recirculating and once-through when the type of system among existing facilities was very mixed.

When more than one new facility was projected for a given SIC code, EPA generally split the existing facilities by waterbody type or by recirculating versus once-through and determined one new projected facility's characteristics based on one set of existing facilities and another new projected facility's characteristics based on the other set of existing facilities. Based on trends, EPA used a bias toward certain characteristics such as recirculating cooling systems, offshore intakes, and passive screens. Since the trend for new facilities is toward the use of cooling towers, flows used may be lower than those for the existing facilities in some cases.

EPA analyzed the characteristic data to assess with which of the New Source Rule's regulatory framework criteria a new facility would already be complying (current compliance assumptions) and what changes would need to be made to comply with all the criteria for their water body (projected compliance actions). Once the compliance actions were determined, EPA developed capital and operation and maintenance (O&M) unit cost estimates for each projected facility. For costing purposes, compliance actions were assumed to be the addition of a technology or a construction modification. The following provides the list of costed technologies or construction actions:

- Intake fanning or widening for velocity reduction
- Canal dredging
- Pipe extensions
- Traveling screen with fish handling devices
- Fish handling equipment
- Passive screens
- Velocity caps
- Cooling Towers

EPA developed cost estimates for three regulatory scenarios: the preferred regulatory framework option, the one standard option, and the dry cooling option. Refer to Chapter 10 of this document for the estimated costs for dry cooling for the other generating facilities. EPA assumed that since manufacturers reused much of their cooling water in their process they would not be able to switch to dry cooling and, therefore, did not develop cost estimates for that scenario. Cost estimates for each scenario are in separate tables provided at the end of this appendix. The costing scenarios are as follows:

- Table 1 - Unit costs for new steam electric generators expected to be built during 2001 to 2010. The cost was estimated based on the regulatory framework.

- Table 2 - Unit costs for new steam electric generators expected to be built during 2001 to 2010. The cost was estimated based on the one standard option (standards for estuaries).

- Table 3 - Unit costs for projected new manufacturers by SIC code projected to build new facilities during 2001 to 2010. The cost was estimated based on the regulatory framework. (To determine the costs for the second ten years, EPA doubled these costs.)

- Table 4 - Unit costs for projected new manufacturers by SIC code projected to build new facilities during 2001 to 2010. The cost was estimated based on the one standard option (standards for estuaries).

- Table 5 - Unit costs for manufacturing facilities in industries that are not projected to build new facilities during 2001 to 2010 but if such a facility were to be built the compliance costs were estimated. The cost was estimated based on the regulatory framework.

- Table 6 - Unit costs for large coal-fired or nuclear plants. EPA does not expect such facilities to be built. The cost was estimated based on the regulatory framework.

- Table 7 - Unit costs for new coal steam plants expected to be built during 2011 to 2020. The cost was estimated based on the regulatory framework.

- Table 8 - Unit costs for new coal steam plants expected to be built during 2011 to 2020. The cost was estimated based on the one standard option (standards for estuaries).

- Table 9 - Unit costs for new combined cycle plants expected to be built during 2011 to 2020. The cost was estimated based on the regulatory framework.

- Table 10 - Unit costs for new combined cycle plants expected to be built during 2011 to 2020. The cost was estimated based on the one standard option (standards for estuaries).

- Table 11 - Unit costs for both the coal-fired and combined cycle generating plants expected to be built during 2011 to 2020. The cost estimate was performed to determine the cost if all the facilities used dry cooling.

The following tables provide the unit costs for the new projected facilities for the compliance scenarios discussed above.

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Table 1. Projected New Generator Characteristics and Needed Compliance Action and Costs

New Gen	Water Body	Flow GPD	Total Water Requirement GPD	Configuration of Facility's CWIS						Technology Types Being Used				
				Canal	Submerged Shoreline	Surface Shoreline	Bay-cove	Submerged Offshore	Other	Fish Diversion	Passive Intakes	Fish Returns	Intake Screens	Other Tech.
GenA	Nontidal River	3,600,000	129,000,000						X					X
GenB	Nontidal River	19,400,000	24,000,000					X					X	
GenC	Lake, Pond or Res.	10,000,000	23,000,000	X				X					X	
GenD	Tidal River	6,500,000	59,000,000					X				X	X	
GenE	Nontidal River	10,400,000	43,000,000										X	
GenF	Nontidal River	3,500,000	67,000,000						X					X
GenG	Lake, Pond or Res.	8,800,000	69,000,000					X					X	

0= Not applicable for this facility under these compliance scenarios

Table 1. Projected New Generator Characteristics and Needed Compliance Action and Costs

New Gen	Profile of Facility's Cooling Water System							Current Compliance Assumptions	Projected Compliance action(s)	Flow in gpm	Flow needed for Recirc Cooling Tower gpm	Flow Needed for activities Other Than Cooling Tower gpm
	Once Through	Once thru w/ ponds	Once thru w/ towers	Recirc.	Recirc w/ ponds	Recirc w/ towers	Other					
GenA						X		Infiltration gallery under river bed: Meets the flow, velocity, and recirc criteria	None	3,000	0	0
GenB						X		Meets the flow, velocity, and recirc criteria	None	13,000	0	0
GenC						X		Meets the flow, velocity, and recirc criteria	Dredge canal	7,000	0	0
GenD						X		Meets the flow, velocity, and recirc criteria	None	5,000	0	0
GenE						X		Meets the flow, velocity, and recirc criteria; assume in the littoral zone; assume Johnson screens maximize the survival of impinged and entrained	None	7,000	0	0
GenF						X		Raney wells under river bed: Meets the flow, velocity, and recirc criteria	None	2,000	0	0
GenG						X		Meets the flow, velocity, and recirc criteria	Extend the pipe	6,000	0	0

Table 1. Projected New Generator Characteristics and Needed Compliance Action and Costs

	Capital Costs									Annual O&M Costs			Total Cost	
New Gen	Velocity Reduction by Intake Fanning or Widening Cost $	Fish Handling Equipment Cost $	Passive Screen 0.5 ft/Sec $	Restoration Cost $	Pipe Extension Cost $	Velocity Cap Cost $	Canal Dredging Cost $	Cooling Tower Cost $	Total Techn. Capital Cost $	O&M Cost for cooling towers $	O&M Cost for Restoration $	Annual O&M Costs for Fish Handling $	Total Estimated Annual Cost $	Total Estimated Capital Costs $
GenA	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
GenB	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
GenC	$0	$0	$0	$0	$0	$0	$236,000	$0	$236,000	$0	$0	$0	$0	$236,000
GenD	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
GenE	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
GenF	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
GenG	$0	$0	$0	$0	$162,000	$0	$0	$0	$162,000	$0	$0	$0	$0	$162,000

Table 2. Projected New Generator Characteristics and Needed Compliance Action and Cost for Uniform Standards

				Configuration of Facility's CWIS						Technology Types Being Used				
New Gen	Water Body	Flow GPD	Total Water Requirement GPD	Canal	Submerged Shoreline	Surface Shoreline	Bay-cove	Submerged Offshore	Other	Fish Diversion	Passive Intakes	Fish Returns	Intake Screens	Other Tech.
GenA	Nontidal River	3,600,000	129,000,000						X					X
GenB	Nontidal River	19,400,000	24,000,000					X					X	
GenC	Lake, Pond or Res.	10,000,000	23,000,000	X				X					X	
GenD	Tidal River	6,500,000	59,000,000					X				X	X	
GenE	Nontidal River	10,400,000	43,000,000										X	
GenF	Nontidal River	3,500,000	67,000,000						X					X
GenG	Lake, Pond or Res.	8,800,000	69,000,000					X					X	

0= Not applicable for this facility under these compliance scenarios

Table 2. Projected New Generator Characteristics and Needed Compliance Action and Cost for Uniform Standards

New Gen	Profile of Facility's Cooling Water System							Current Compliance Assumptions	Projected Compliance action(s)	Flow in gpm	Flow needed for Recirc Cooling Tower gpm	Flow Needed for activities Other Than Cooling Tower gpm
	Once Through	Once thru w/ ponds	Once thru w/ towers	Recirc.	Recirc w/ ponds	Recirc w/ towers	Other					
GenA						X		Infiltration gallery under river bed: Meets the flow, velocity, and recirc criteria	None	3,000	0	0
GenB						X		Meets the flow, velocity, and recirc criteria	None	13,000	0	0
GenC						X		Meets the flow, velocity, and recirc criteria	Dredge canal	7,000	0	0
GenD						X		Meets the flow, velocity, and recirc.criteria	None	5,000	0	0
GenE						X		Meets the flow, velocity, and recirc criteria; assume in the littoral zone; assume Johnson screens maximize the survival of impinged and entrained organisms	None	7,000	0	0
GenF						X		Raney wells under river bed: Meets the flow, velocity, and recirc criteria	None	2,000	0	0
GenG						X		Meets the flow, velocity, and recirc criteria	Extend the pipe	6,000	0	0

Table 2. Projected New Generator Characteristics and Needed Compliance Action and Cost for Uniform Standards

	Capital Costs									Annual O&M Costs			Total Cost	
New Gen	Velocity Reduction by Intake Fanning or Widening Cost $	Fish Handling Equipment Cost $	Passive Screen 0.5 ft/Sec $	Restoration Cost $	Pipe Extension Cost $	Velocity Cap Cost $	Canal Dredging Cost $	Cooling Tower Cost $	Total Techn. Capital Cost $	O&M Cost for cooling towers $	O&M Cost for Restoration $	Annual O&M Costs for Fish Handling $	Total Estimated Annual Cost $	Total Estimated Capital Costs $
GenA	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
GenB	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
GenC	$0	$0	$0	$0	$0	$0	$236,000	$0	$236,000	$0	$0	$0	$0	$236,000
GenD	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
GenE	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
GenF	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
GenG	$0	$0	$0	$0	$162,000	$0	$0	$0	$162,000	$0	$0	$0	$0	$162,000

Table 3. Projected New Manufacturing Facility Characteristics and Needed Compliance Action and Costs

Primary SIC code	Water Body	Flow GPD	Total Water Requirement GPD	Configuration of Facility's CWIS					
				Canal	Submerged Shoreline	Surface Shoreline	Bay-cove	Submerged Offshore	Other
new 2812-1	Nontidal River	72,400,000	482,666,667					X	
new 2813-1									
new 2819-1	Nontidal River	6,000,000	6,000,000		X				
new 2819-2	Tidal River	33,000,000	51,711,000					X	
new 2821-1	Nontidal River	9,500,000	14,886,500					X	
new 2821-2	Lake, Pond or Res.	26,640,000	26,640,000					X	
new 2821-3	Tidal River	5,000,000	33,333,333					X	
new 2824-1									
new 2833-1	Nontidal River	16,347,000	25,615,749					X	
new 2834-1									
new 2841-1	Lake, Pond or Res.	7,180,000	7,180,000					X	
new 2865-1									
new 2869-1	Nontidal River	12,000,000	12,000,000					X	
new 2869-2	Nontidal River	12,000,000	12,000,000					X	
new 2869-3	Nontidal River	2,400,000	16,000,000					X	
new 2869-4	Nontidal River	2,400,000	16,000,000					X	
new 2869-5	Nontidal River	2,400,000	16,000,000					X	
new 2869-6	Nontidal River	45,000,000	70,515,000		X				
new 2869-7	Nontidal River	45,000,000	70,515,000		X				

Table 3. Projected New Manufacturing Facility Characteristics and Needed Compliance Action and Costs

	Technology Types Being Used					Profile of Facility's Cooling Water System						
Primary SIC code	Fish Diversion	Passive Intakes	Fish Returns	Intake Screens	Other Tech.	Once Through	Once thru w/ ponds	Once thru w/ towers	Recirc.	Recirc w/ ponds	Recirc w/ towers	Other
new 2812-1				X							X	
new 2813-1												
new 2819-1		X		X		X						
new 2819-2				X		X					X	
new 2821-1		X		X		X					X	
new 2821-2		X		X			X					
new 2821-3				X							X	
new 2824-1												
new 2833-1				X		X					X	X
new 2834-1												
new 2841-1				X		X						
new 2865-1												
new 2869-1		X		X		X						
new 2869-2		X		X		X						
new 2869-3				X							X	
new 2869-4				X							X	
new 2869-5				X							X	
new 2869-6				X		X					X	
new 2869-7				X		X					X	

Table 3. Projected New Manufacturing Facility Characteristics and Needed Compliance Action and Costs

Primary SIC code	Current Compliance Assumptions	Projected Compliance Actions	Flow in gpm	Flow needed for Recirculating Cooling Tower gpm	Flow Needed for Activities Other Than Cooling Tower gpm
new 2812-1	Trend for recirculating & submerged offshore; Assume meets intake flow criteria & 100% recirc criteria	Enlarge intake pipe opening to achieve 0.5 fps velocity	50,300	0	50,300
new 2813-1	Assume meets intake flow criteria & velocity criteria; assume cannot extend 50 meters beyond littoral zone	Install cooling towers to make 100% recirc; Add fish baskets to maximize survival (for remaining flow)			
new 2819-1	Assume meets intake flow criteria & velocity criteria, & maximizes survival of impinged & minimizes entrainment because of passive screens; After switching to 100% recirc, facility flow is less than 2 MGD so no other action is required	Install cooling towers to make 100% recirc	4,200	4,200	600
new 2819-2	Trend for submerged & recirculating; Assume meets intake flow volume criteria after switching to 100% recirculating system	Install cooling towers to make 100% recirc; Install passive screens to achieve 0.5 fps velocity and maximize survival of impinged & minimize entrainment	22,900	20,600	5,400
new 2821-1	Trend is for recirculating & submerged; Assume meets intake flow criteria & velocity criteria	Extend pipe to be 50 meters outside littoral zone	6,600	5,900	1,600
new 2821-2	Assume does not alter natural stratification after pipe extension	Extend pipe to be 50 meters outside littoral zone	18,500	18,500	2,800
new 2821-3	Trend is for recirculating; Assume meets intake flow criteria	Install passive screens to achieve 0.5 fps velocity and maximize survival of impinged & minimize entrainment	3,500	0	3,500
new 2824-1	Trend for recirculating; Assume meets intake flow criteria, velocity criteria, & 100% recirc criteria; Assume maximizes survival & minimizes impingement because of passive screens and fish returns	None			
new 2833-1	Trend for recirculating; Assume meets intake flow criteria. Assume 50 meters outside littoral zone.	None	11,400	10,300	2,700
new 2834-1	Intake flow criteria not met, so switch to recirculating and then since flow is less than 2 MGD, no other action is required	Install cooling tower to make 100% recirc			
new 2841-1	Assume none of the criteria met.After switching to 100% recirc, facility flow is less than 2 MGD so no other action is required	Install cooling tower for 100% recirc.	5,000	5,000	800
new 2865-1	Trend for recirculating; Assume meets intake flow criteria, velocity criteria (passive screens) & 50 meters outside littoral zone	None			
new 2869-1	Once through only (based on 10 facilities); Assume meets intake flow criteria, velocity criteria (passive screen); After switching to 100% recirc, flow is less than 2 MGD so no other action is requried	Install cooling tower to make 100% recirc	8,300	8,300	1,200
new 2869-2	Once through only (based on 10 facilities); Assume meets intake flow criteria, velocity criteria (passive screen); After switching to 100% recirc, flow is less than 2 MGD so no other action is requried	Install cooling tower to make 100% recirc	8,300	8,300	1,200
new 2869-3	Recirc only (based on data for 7 facilities); Assume meets intake flow & recirc criteria	Install velocity caps to meet velocity criteria	1,700	0	1,700
new 2869-4	Recirc only (based on data for 7 facilities); Assume meets intake flow & recirc criteria	Install velocity caps to meet velocity criteria	1,700	0	1,700
new 2869-5	Recirc only (based on data for 7 facilities); Assume meets intake flow & recirc criteria	Install velocity caps to meet velocity criteria	1,700	0	1,700
new 2869-6	Recirc & once thru (based on 3 facilities); assume meets velocity criteria	Extend pipe to be 50 meters outside littoral zone	31,300	28,200	7,400
new 2869-7	Recirc & once thru (based on 3 facilities); assume meets velocity criteria	Extend pipe to be 50 meters outside littoral zone	31,300	28,200	7,400

Table 3. Projected New Manufacturing Facility Characteristics and Needed Compliance Action and Costs

Primary SIC code	Capital Costs								
	Velocity Reduction by Intake Fanning or Widening Cost $	Fish Handling Equipment Cost $	Passive Screen 0.5 ft/Sec $	Restoration Cost $	Pipe Extension Cost $	Velocity Cap Cost $	Canal Dredging Cost $	Cooling Tower Cost $	Total Techn. Capital Cost $
new 2812-1	$24,000	$0	$0	$0	$0	$0	$0	$0	$24,000
new 2813-1									
new 2819-1	$0	$0	$0	$0	$0	$0	$0	$320,000	$320,000
new 2819-2	$0	$0	$60,000	$0	$0	$0	$0	$1,452,000	$1,512,000
new 2821-1	$0	$0	$0	$0	$170,000	$0	$0	$0	$170,000
new 2821-2	$0	$0	$0	$0	$300,000	$0	$0	$0	$300,000
new 2821-3	$0	$0	$47,000	$0	$0	$0	$0	$0	$47,000
new 2824-1									
new 2833-1	$0	$0	$0	$0	$0	$0	$0	$0	$0
new 2834-1									
new 2841-1	$0	$0	$0	$0	$0	$0	$0	$375,000	$375,000
new 2865-1									
new 2869-1	$0	$0	$0	$0	$0	$0	$0	$605,000	$605,000
new 2869-2	$0	$0	$0	$0	$0	$0	$0	$605,000	$605,000
new 2869-3	$0	$0	$0	$0	$0	$21,000	$0	$0	$21,000
new 2869-4	$0	$0	$0	$0	$0	$21,000	$0	$0	$21,000
new 2869-5	$0	$0	$0	$0	$0	$21,000	$0	$0	$21,000
new 2869-6	$0	$0	$0	$0	$400,000	$0	$0	$0	$400,000
new 2869-7	$0	$81,000	$0	$0	$400,000	$0	$0	$0	$481,000

Table 3. Projected New Manufacturing Facility Characteristics and Needed Compliance Action and Costs

	Annual O&M Costs			Total Costs	
Primary SIC code	O&M Cost for cooling towers $	O&M Cost for Restoration $	Annual O&M Costs for Fish Handling $	Total Estimated Annual Cost $	Total Estimated Capital Costs $
new 2812-1	$0	$0	$0	$0	$24,000
new 2813-1				$419,300	$1,752,000
new 2819-1	$89,000	$0	$0	$89,000	$320,000
new 2819-2	$357,000	$0	$0	$357,000	$1,512,000
new 2821-1	$0	$0	$0	$0	$170,000
new 2821-2	$0	$0	$0	$0	$300,000
new 2821-3	$0	$0	$0	$0	$47,000
new 2824-1				$0	$0
new 2833-1	$0	$0	$0	$0	$0
new 2834-1				$111,000	$410,000
new 2841-1	$102,000	$0	$0	$102,000	$375,000
new 2865-1				$0	$0
new 2869-1	$157,000	$0	$0	$157,000	$605,000
new 2869-2	$157,000	$0	$0	$157,000	$605,000
new 2869-3	$0	$0	$0	$0	$21,000
new 2869-4	$0	$0	$0	$0	$21,000
new 2869-5	$0	$0	$0	$0	$21,000
new 2869-6	$0	$0	$0	$0	$400,000
new 2869-7	$479,000	$0	$4,700	$483,700	$481,000

Table 3. Projected New Manufacturing Facility Characteristics and Needed Compliance Action and Costs

Primary SIC code	Water Body	Flow GPD	Total Water Requirement GPD	Configuration of Facility's CWIS					
				Canal	Submerged Shoreline	Surface Shoreline	Bay-cove	Submerged Offshore	Other
new 2869-8	Nontidal River	45,000,000	70,515,000		X				
new 2869-9	Nontidal River	12,000,000	80,000,000	X					
new 2873-1									
new 2874-1	Lake, Pond or Res.	4,612,500	30,750,000					X	
new 2899-1									
new 3312-1	Tidal River	31,500,000	49,360,500					X	
new 3312-2	Nontidal River	16,700,000	111,333,333					X	
new 3312-3	Lake, Pond or Res.	76,000,000	119,092,000		X				
new 3316-1									
new 3353-1									

0= Not applicable for this facility under these compliance scenarios

[redacted] Contains Confidential Business Information

Notes/Assumptions for Facility Characteristics and Compliance Determination:

1) Facility with a passive screen is assumed to meet the 0.5 fps velocity criteria

2) Location: Facility with a shoreline, canal, or bay/cove intake is assumed to be in the littoral zone; Facility with an offshore intake is assumed to be less than 50 meters outside the littoral zone. As noted in the new source document, about 85% of the units in the EIA-767 database likely to have intakes have them less than 125 meters from shore, with a median distance of about 17 meters

3) Flow: Comments on flow are imbedded in the cells of the spreadsheet and can be viewed electronically; Since the trend for new facilities is toward the use of cooling towers, flows used may be lower than those for the existing facilities in some cases. All facilities that intake less than 2MGD were assumed to intake <1% of the source waterbody flow and thus are exempt.

4) All facilities assumed to have one intake, which seems reasonable for chemical and metals manufacturers since even most utilities have 1 or 2 intakes (verify) and typically use much higher flows.

Costing Assumptions:

5) If a facility is once through only and is projected to switch to a 100% recirculating system, the flow used for costing the cooling tower is 15% of the original flow since the flow will be reduced in the new system.

6) If a facility starts out as a combined once through and recirculating system, the facility is assumed to have 10% of the initial flow attributed to recirculating and 90% to the once through part of the system. The relative portions of the total flow are used for costing compliance actions.

Table 3. Projected New Manufacturing Facility Characteristics and Needed Compliance Action and Costs

	Technology Types Being Used					Profile of Facility's Cooling Water System						
Primary SIC code	Fish Diversion	Passive Intakes	Fish Returns	Intake Screens	Other Tech.	Once Through	Once thru w/ ponds	Once thru w/ towers	Recirc.	Recirc w/ ponds	Recirc w/ towers	Other
new 2869-8				X		X					X	
new 2869-9		X	X	X						X		
new 2873-1												
new 2874-1				X							X	
new 2899-1												
new 3312-1	X			X		X					X	
new 3312-2				X							X	
new 3312-3				X		X					X	
new 3316-1												
new 3353-1												

Table 3. Projected New Manufacturing Facility Characteristics and Needed Compliance Action and Costs

Primary SIC code	Current Compliance Assumptions	Projected Compliance Actions	Flow in gpm	Flow needed for Recirculating Cooling Tower gpm	Flow Needed for Activities Other Than Cooling Tower gpm
new 2869-8	Recirc & once thru (based on 3 facilities); assume meets velocity criteria	Extend pipe to be 50 meters outside littoral zone	31,300	28,200	7,400
new 2869-9	Due to trend for recirc (based on all data); Assume meets intake flow criteria, velocity criteria (passive screen), recirc criteria, maximizes survival of impinged & minimizes entrained because of passive screens & fish returns	None	8,300	0	8,300
new 2873-1	Assume meets intake flow criteria, meets recirc criteria	Install fish handling equipment to maximize survival of impinged fish & minimize entrainment			
new 2874-1	Assume does not alter natural stratification of lake, meets recirc criteria; Assume cannot extend intake pipe to 50 meters outside littoral zone due to local geography	Install passive screens to meet 0.5 fps	3,200	0	3,200
new 2899-1	Once through only and recirc systems; Assume meets intake flow criteria, velocity criteria (passive screen); After switching to 100% recirc, flow is less than 2 MGD so no other action is required	Install cooling tower to make 100% recirc			
new 3312-1	Assume meets intake flow criteria after switch to 100% recirculating system	Install cooling towers to switch rest of system to recirc; Install passive screens to meet 0.5 fps and maximize survival & minimize entrained	21,900	19,700	5,100
new 3312-2	Trend for recirculating; Assume meets intake flow criteria	Install velocity caps to meet 0.5 fps	11,600	0	11,600
new 3312-3	Trend for recirculating; Assume does not alter natural stratification of source water after switch to all recirc	Extend the pipe to 50 meters ouside the littoral zone	52,800	47,500	12,400
new 3316-1	Trend for recirculating; Assume meets intake flow criteria, velocity criteria, recirc criteria, maximize survival of impinged & minimize entrained because of passive screens & recirc system	None			
new 3353-1	Assume meets intake flow criteria & recirc criteria; Assume cannot extend intake pipe to 50 meters outside littoral zone due to local geography	Enlarge intake pipe opening to meet 0.5 fps			

Table 3. Projected New Manufacturing Facility Characteristics and Needed Compliance Action and Costs

	Capital Costs								
Primary SIC code	Velocity Reduction by Intake Fanning or Widening Cost $	Fish Handling Equipment Cost $	Passive Screen 0.5 ft/Sec $	Restoration Cost $	Pipe Extension Cost $	Velocity Cap Cost $	Canal Dredging Cost $	Cooling Tower Cost $	Total Techn. Capital Cost $
new 2869-8	$0	$81,000	$0	$0	$400,000	$0	$0	$0	$481,000
new 2869-9	$0	$0	$0	$0	$0	$0	$0	$0	$0
new 2873-1									
new 2874-1	$0	$0	$44,000	$0	$0	$0	$0	$0	$44,000
new 2899-1									
new 3312-1	$0	$0	$60,000	$0	$0	$0	$0	$1,390,000	$1,450,000
new 3312-2	$0	$0	$0	$0	$0	$21,000	$0	$0	$21,000
new 3312-3	$0	$0	$0	$0	$700,000	$0	$0	$0	$700,000
new 3316-1									
new 3353-1									

Table 3. Projected New Manufacturing Facility Characteristics and Needed Compliance Action and Costs

	Annual O&M Costs			Total Costs	
Primary SIC code	O&M Cost for cooling towers $	O&M Cost for Restoration $	Annual O&M Costs for Fish Handling $	Total Estimated Annual Cost $	Total Estimated Capital Costs $
new 2869-8	$479,000	$0	$4,700	$483,700	$481,000
new 2869-9	$0	$0	$0	$0	$0
new 2873-1				$5,200	$91,000
new 2874-1	$0	$0	NA	$0	$44,000
new 2899-1				$84,000	$299,000
new 3312-1	$342,000	$0	$0	$342,000	$1,450,000
new 3312-2	$0	$0	$0	$0	$21,000
new 3312-3	$0	$0	$0	$0	$700,000
new 3316-1				$0	$0
new 3353-1				$0	$3,000

Table 4. Projected New Manufacturer Characteristics, Needed Compliance Action and Costs for Uniform Standard

Primary SIC code	Water Body	FLOW GPD	Total Water Requirement GPD	Flow needed for Recirculating Cooling Tower gpm	Flow Used for Costing Activities Other Than Cooling Tower gpm	Configuration of Facility's CWIS					
						Canal	Submerged Shoreline	Surface Shoreline	Bay-cove	Submerged Offshore	Other
new 2812-1	Nontidal River	72,400,000	482,666,667	-	50,300					X	
new 2813-1											
new 2819-1	Nontidal River	6,000,000	6,000,000	4,200	600		X				
new 2819-2	Tidal River	33,000,000	51,711,000	20,600	5,400					X	
new 2821-1	Nontidal River	9,500,000	14,886,500	5,900	1,600					X	
new 2821-2	Lake, Pond or Res.	26,640,000	26,640,000	18,500	2,800					X	
new 2821-3	Tidal River	5,000,000	33,333,333	-	3,500					X	
new 2824-1											
new 2833-1	Nontidal River	16,347,000	25,615,749	10,300	2,700					X	
new 2834-1											
new 2841-1	Lake, Pond or Res.	7,180,000	7,180,000	5,000	800					X	
new 2865-1											
new 2869-1	Nontidal River	12,000,000	12,000,000	8,300	1,200					X	
new 2869-2	Nontidal River	12,000,000	12,000,000	8,300	1,200					X	
new 2869-3	Nontidal River	2,400,000	16,000,000	-	1,700					X	
new 2869-4	Nontidal River	2,400,000	16,000,000	-	1,700					X	
new 2869-5	Nontidal River	2,400,000	16,000,000	-	1,700					X	
new 2869-6	Nontidal River	45,000,000	70,515,000	28,200	7,400		X				

Table 4. Projected New Manufacturer Characteristics, Needed Compliance Action and Costs for Uniform Standard

	Technology Types Being Used					Profile of Facility's Cooling Water System						
Primary SIC code	Fish Diversion	Passive Intakes	Fish Returns	Intake Screens	Other Tech.	Once Through	Once through w/ ponds	Once through w/ towers	Recirc.	Recirc w/ ponds	Recirc w/ towers	Other
new 2812-1				X							X	
new 2813-1												
new 2819-1		X		X		X						
new 2819-2				X		X					X	
new 2821-1		X		X		X					X	
new 2821-2		X		X			X					
new 2821-3				X							X	
new 2824-1												
new 2833-1				X		X					X	X
new 2834-1												
new 2841-1				X		X						
new 2865-1												
new 2869-1		X		X		X						
new 2869-2		X		X		X						
new 2869-3				X							X	
new 2869-4				X							X	
new 2869-5				X							X	
new 2869-6				X		X					X	

Table 4. Projected New Manufacturer Characteristics, Needed Compliance Action and Costs for Uniform Standard

Primary SIC code	Current Compliance Assumptions	Projected Compliance Action(s)
new 2812-1	Trend for recirculating & submerged offshore; Assume meets intake flow criteria & 100% recirc criteria	Enlarge intake pipe opening to achieve 0.5 fps velocity and install velocity cap; install fish handling and return equipment
new 2813-1	Passive and travel screens. Assume meets intake flow criteria & velocity criteria	Install cooling towers to make 100% recirc. Add fish baskets to maximize survival (for remaining flow)
new 2819-1	Assume meets intake flow criteria & velocity criteria, & maximizes survival of impinged & minimizes entrainment because of passive screens; After switching to 100% recirc, facility flow is less than 2 MGD so no other action is required	Install cooling towers to make 100% recirc
new 2819-2	Trend for submerged & recirculating; Assume meets intake flow volume and velocity criteria after switching to 100% recirculating system	Install cooling towers to make 100% recirc; Install fish handling equipment to maximize survival of impinged fish & minimize entrainment.
new 2821-1	Trend is for recirculating & submerged; Assume meets intake velocity criteria	Install cooling towers to make 100% recirc. Install fish handling equipment to maximize survival of impinged fish & minimize entrainment
new 2821-2	Trend for submerged; Passive screens and intake screens. Assume meets intake flow volume criteria after switching to 100% recirculating system	Install cooling towers to make 100% recirc. Install fish handling equipment to maximize survival of impinged fish & minimize entrainment
new 2821-3	Trend is for recirculating; Assume meets 100% recirc. flow criteria; estend the pipe to get outside of sensitive biological area	Install fish handling equipment to maximize survival of impinged fish & minimize entrainment; extend intake pipe
new 2824-1	Trend for recirculating; Assume meets intake flow criteria, velocity criteria, & 100% recirc criteria; Assume maximizes survival & minimizes impingement because of passive screens and fish returns	None
new 2833-1	Trend for recirculating; Assume meets intake flow and velocity criteria after switching to 100% recirculating	Add cooling tower for 100% recirc; install fish handling equipment for impingement and entrainment
new 2834-1	Intake flow criteria not met, so switch to recirculating and then since flow is less than 2 MGD, no other action is required	Install cooling tower to make 100% recirc
new 2841-1	Assume none of the criteria met.After switching to 100% recirc, facility flow is less than 2 MGD so no other action is required	Install cooling tower for 100% recirc.
new 2865-1	Trend for recirculating; Assume meets intake flow criteria, velocity criteria (passive screens) & 100% recirc criteria and passive screens minimize impingement and entrainment	None
new 2869-1	Once through only (based on 10 facilities); Assume meets intake flow criteria, velocity criteria (passive screen); After switching to 100% recirc, flow is less than 2 MGD so no other action is required	Install cooling tower to make 100% recirc
new 2869-2	Once through only (based on 10 facilities); Assume meets intake flow criteria, velocity criteria (passive screen); After switching to 100% recirc, flow is less than 2 MGD so no other action is required	Install cooling tower to make 100% recirc
new 2869-3	Recirc only (based on data for 7 facilities); Assume meets intake flow & recirc criteria	Install velocity caps and reduce velocity through fanning to meet velocity criteria; install fish handling equipment
new 2869-4	Recirc only (based on data for 7 facilities); Assume meets intake flow & recirc criteria	Install velocity caps and reduce velocity through fanning to meet velocity criteria; install fish handling equipment
new 2869-5	Recirc only (based on data for 7 facilities); Assume meets intake flow & recirc criteria	Install velocity caps and reduce velocity through fanning to meet velocity criteria; install fish handling equipment
new 2869-6	Recirc & once through (based on 3 facilities); Intake flow criteria not met before cooling towers	Install cooling tower for once through portion of flow to meet intake flow criteria, velocity criteria (same size intake but reduced flow now) & recirc criteria, & minimize entrainment (reduced velocity & flow); Add fish baskets to maximize survival of impinged fish

Table 4. Projected New Manufacturer Characteristics, Needed Compliance Action and Costs for Uniform Standard

Primary SIC code	Capital Costs										
	Velocity Reduction by Intake Fanning or Widening Cost $	Fish Handling Equipment Cost $	Passive Screen 0.5 fps $	Travel Screens with Fish Handling Equipment $	Area Restored ha	Restoration Cost $	Pipe Extension Cost $	Velocity Cap Cost $	Canal Dredging Cost $	Cooling Tower Cost $	Total Tech.. Capital Cost $
new 2812-1	$24,000	$153,000	$0	$0	$0	$0	$0	$37,000	$0	$0	$214,000
new 2813-1											
new 2819-1	$0	$0	$0	$0	$0	$0	$0	$0	$0	$320,000	$320,000
new 2819-2	$0	$66,000	$0	$0	$0	$0	$0	$0	$0	$1,452,000	$1,518,000
new 2821-1	$0	$38,000	$0	$0	$0	$0	$0	$0	$0	$438,000	$476,000
new 2821-2	$0	$45,000	$0	$0	$0	$0	$0	$0	$0	$1,308,000	$1,353,000
new 2821-3	$0	$51,000	$0	$0	$0	$0	$130,000	$0	$0	$0	$181,000
new 2824-1											
new 2833-1	$0	$45,000	$0	$0	$0	$0	$0	$0	$0	$744,000	$789,000
new 2834-1											
new 2841-1	$0	$0	$0	$0	$0	$0	$0	$0	$0	$375,000	$375,000
new 2865-1											
new 2869-1	$0	$0	$0	$0	$0	$0	$0	$0	$0	$605,000	$605,000
new 2869-2	$0	$0	$0	$0	$0	$0	$0	$0	$0	$605,000	$605,000
new 2869-3	$3,000	$38,000	$0	$0	$0	$0	$0	$21,000	$0	$0	$62,000
new 2869-4	$3,000	$38,000	$0	$0	$0	$0	$0	$21,000	$0	$0	$62,000
new 2869-5	$3,000	$38,000	$0	$0	$0	$0	$0	$21,000	$0	$0	$62,000
new 2869-6	$0	$81,000	$0	$0	$0	$0	$0	$0	$0	$1,967,000	$2,048,000

Table 4. Projected New Manufacturer Characteristics, Needed Compliance Action and Costs for Uniform Standard

	Annual O&M Costs						Total Costs	
Primary SIC code	O&M Cost for cooling towers $	Number of Restocked Fish 1000	O&M Cost for Restoration $	Estimated Annual Cost for Gray water Purchase $	Annual O&M Costs for Travel Screens with Fish Handling Equipment $	Annual O&M Costs for Fish Handling $	Total Estimated Annual Cost $	Total Estimated Capital Costs $
new 2812-1	$0	$0	$0	$0	$0	$21,000	$21,000	$214,000
new 2813-1							$423,300	$1,752,000
new 2819-1	$89,000	$0	$0	$0	$0	$0	$89,000	$320,000
new 2819-2	$357,000	$0	$0	$0	$0	$4,000	$361,000	$1,518,000
new 2821-1	$117,000	$0	$0	$0	$0	$2,300	$119,300	$476,000
new 2821-2	$323,000	$0	$0	$0	$0	$2,900	$325,900	$1,353,000
new 2821-3	$0	$0	$0	$0	$0	$3,200	$3,200	$181,000
new 2824-1							$0	$0
new 2833-1	$189,000	$0	$0	$0	$0	$2,800	$191,800	$789,000
new 2834-1							$111,000	$410,000
new 2841-1	$102,000	$0	$0	$0	$0	$0	$102,000	$375,000
new 2865-1							$0	$0
new 2869-1	$157,000	$0	$0	$0	$0	$0	$157,000	$605,000
new 2869-2	$157,000	$0	$0	$0	$0	$0	$157,000	$605,000
new 2869-3	$0	$0	$0	$0	$0	$2,300	$2,300	$62,000
new 2869-4	$0	$0	$0	$0	$0	$2,300	$2,300	$62,000
new 2869-5	$0	$0	$0	$0	$0	$2,300	$2,300	$62,000
new 2869-6	$479,000	$0	$0	$0	$0	$4,700	$483,700	$2,048,000

Table 4. Projected New Manufacturer Characteristics, Needed Compliance Action and Costs for Uniform Standard

Primary SIC code	Water Body	FLOW GPD	Total Water Requirement GPD	Flow needed for Recirculating Cooling Tower gpm	Flow Used for Costing Activities Other Than Cooling Tower gpm	Configuration of Facility's CWIS					
						Canal	Submerged Shoreline	Surface Shoreline	Bay-cove	Submerged Offshore	Other
new 2869-7	Nontidal River	45,000,000	70,515,000	28,200	7,400		X				
new 2869-8	Nontidal River	45,000,000	70,515,000	28,200	7,400		X				
new 2869-9	Nontidal River	12,000,000	80,000,000	-	8,300	X					
new 2873-1	[redacted]										
new 2874-1	Lake, Pond or Res.	4,612,500	30,750,000	-	3,200					X	
new 2899-1	[redacted]										
new 3312-1	Tidal River	31,500,000	49,360,500	19,700	5,100					X	
new 3312-2	Nontidal River	16,700,000	111,333,333	-	11,600					X	
new 3312-3	Lake, Pond or Res.	76,000,000	119,092,000	47,500	12,400		X				
new 3316-1	[redacted]										
new 3353-1	[redacted]										

0= Not applicable for this facility under these compliance scenarios

[redacted] Contains Confidential Business Information

Notes/Assumptions for Facility Characteristics and Compliance Determination:

1) Facility with a passive screen is assumed to meet the 0.5 fps velocity criteria

2) Location: Facility with a shoreline, canal, or bay/cove intake is assumed to be in the littoral zone; Facility with an offshore intake is assumed to be less than 50 meters outside the littoral zone. As noted in the new source document, about 85% of the units in the EIA-767 database likely to have intakes less than 75 meters from shore, with a median distance of about 17 meters

3) Flow: Comments on flow are imbedded in the cells of the spreadsheet and can be viewed electronically; Since the trend for new facilities is toward the use of cooling towers, flows used may be lower than those for the existing facilities in some cases. All facilities that intake less than 2MGD were assumed to intake <1% of the source waterbody flow and thus are exempt.

4) All facilities assumed to have one intake, which seems reasonable for chemical and metals manufacturers since even most utilities have 1 or 2 intakes (verify) and typically use much higher flows.

Costing Assumptions:

5) If a facility is once through only and is projected to switch to a 100% recirculating system, the flow used for costing the cooling tower is 15% of the original flow since the flow will be reduced in the new system.

6) If a facility starts out as a combined once through and recirculating system, the facility is assumed to have 10% of the initial flow attributed to recirculating and 90% to the once through part of the system. The relative portions of the total flow are used for costing compliance actions.

Table 4. Projected New Manufacturer Characteristics, Needed Compliance Action and Costs for Uniform Standard

	Technology Types Being Used					Profile of Facility's Cooling Water System						
Primary SIC code	Fish Diversion	Passive Intakes	Fish Returns	Intake Screens	Other Tech.	Once Through	Once through w/ ponds	Once through w/ towers	Recirc.	Recirc w/ ponds	Recirc w/ towers	Other
new 2869-7				X		X					X	
new 2869-8				X		X					X	
new 2869-9		X	X	X						X		
new 2873-1												
new 2874-1				X							X	
new 2899-1												
new 3312-1	X			X		X					X	
new 3312-2				X							X	
new 3312-3				X		X					X	
new 3316-1												
new 3353-1												

Table 4. Projected New Manufacturer Characteristics, Needed Compliance Action and Costs for Uniform Standard

Primary SIC code	Current Compliance Assumptions	Projected Compliance Action(s)
new 2869-7	Recirc & once through (based on 3 facilities); Intake flow criteria not met before cooling towers	Install cooling tower for once through portion of flow to meet intake flow criteria, velocity criteria (same size intake but reduced flow now) & recirc criteria, & minimize entrainment (reduced velocity & flow); Add fish baskets to maximize survival of impinged fish
new 2869-8	Recirc & once through (based on 3 facilities); Intake flow criteria not met before cooling towers	Install cooling tower for once through portion of flow to meet intake flow criteria, velocity criteria (same size intake but reduced flow now) & recirc criteria, & minimize entrainment (reduced velocity & flow); Add fish baskets to maximize survival of impinged fish
new 2869-9	Due to trend for recirc (based on all data); Assume meets intake flow criteria, velocity criteria (passive screen), recirc criteria, maximizes survival of impinged & minimizes entrained because of passive screens & fish returns	None
new 2873-1	Assume meets intake flow criteria, meets recirc criteria	Install fish handling equipment for maximize survival of impinged & minimize entrainment
new 2874-1	Meets recirc criteria	Install fish handling equipment for maximize survival of impinged & minimize entrainment
new 2899-1	Once through only and recirc systems; Assume meets intake flow criteria, velocity criteria (passive screen); After switching to 100% recirc, flow is less than 2 MGD so no other action is required	Install cooling tower to make 100% recirc
new 3312-1	Assume meets intake flow criteria after switch to 100% recirculating system. Trend for fish diversion technology; travel screen	Install cooling towers to switch rest of system to recirc; Extend intake pipe
new 3312-2	Trend for recirculating; Assume meets 100% recirc criteria	Install velocity caps; install fish handling to maximize survival of entrained
new 3312-3	Trend for recirculating; Assume does not alter natural stratification of source water after switch to all recirc; Assume cannot extend intake pipe to 50 meters outside littoral zone due to local geography	Install cooling towers to switch rest of system to recirculating; install Travel screens with fish handling to maximize survival of impinged & minimize entrained
new 3316-1	Trend for recirculating; Assume meets intake flow criteria, velocity criteria, recirc criteria, maximize survival of impinged & minimize entrained because of passive screens & recirc system	None
new 3353-1	Assume meets intake flow criteria & 100% recirc criteria	Enlarge intake pipe opening to meet 0.5 fps; install fish handling equipment and fish baskets to maximize survival of impinged and entrained

Table 4. Projected New Manufacturer Characteristics, Needed Compliance Action and Costs for Uniform Standard

	Capital Costs										
Primary SIC code	Velocity Reduction by Intake Fanning or Widening Cost $	Fish Handling Equipment Cost $	Passive Screen 0.5 fps $	Travel Screens with Fish Handling Equipment $	Area Restored ha	Restoration Cost $	Pipe Extension Cost $	Velocity Cap Cost $	Canal Dredging Cost $	Cooling Tower Cost $	Total Tech.. Capital Cost $
new 2869-7	$0	$81,000	$0	$0	$0	$0	$0	$0	$0	$1,967,000	$2,048,000
new 2869-8	$0	$81,000	$0	$0	$0	$0	$0	$0	$0	$1,967,000	$2,048,000
new 2869-9	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
new 2873-1											
new 2874-1	$0	$48,000	$0	$0	$0	$0	$0	$0	$0	$0	$48,000
new 2899-1											
new 3312-1	$0	$0	$0	$0	$0	$0	$150,000	$0	$0	$1,390,000	$1,540,000
new 3312-2	$0	$102,000	$0	$0	$0	$0	$0	$21,000	$0	$0	$123,000
new 3312-3	$0	$0	$0	$292,000	$0	$0	$0	$0	$0	$3,250,000	$3,542,000
new 3316-1											
new 3353-1											

Table 4. Projected New Manufacturer Characteristics, Needed Compliance Action and Costs for Uniform Standard

	Annual O&M Costs						Total Costs	
Primary SIC code	O&M Cost for cooling towers $	Number of Restocked Fish 1000	O&M Cost for Restoration $	Estimated Annual Cost for Gray water Purchase $	Annual O&M Costs for Travel Screens with Fish Handling Equipment $	Annual O&M Costs for Fish Handling $	Total Estimated Annual Cost $	Total Estimated Capital Costs $
new 2869-7	$479,000	$0	$0	$0	$0	$4,700	$483,700	$2,048,000
new 2869-8	$479,000	$0	$0	$0	$0	$4,700	$483,700	$2,048,000
new 2869-9	$0	$0	$0	$0	$0	$0	$0	$0
new 2873-1							$5,200	$91,000
new 2874-1	$0	$0	$0	$0	$0	$3,100	$3,100	$48,000
new 2899-1							$84,000	$299,000
new 3312-1	$342,000	$0	$0	$0	$0	$0	$342,000	$1,540,000
new 3312-2	$0	$0	$0	$0	$0	$5,700	$5,700	$123,000
new 3312-3	$784,000	$0	$0	$0	$17,000	$0	$801,000	$3,542,000
new 3316-1							$0	$0
new 3353-1							$2,600	$45,000

Table 5. Case Study Manufacturer Characteristics and Needed Compliance Actions and Costs

				Configuration of Facility's CWIS						Technology Types Being Used				
Primary SIC code	Water Body	Flow GPD	Total Water Requirement GPD	Canal	Submerge Shoreline	Surface Shoreline	Bay-cove	Submerged Offshore	Other	Fish Diversion	Passive Intakes	Fish Returns	Intake Screens	Other Tech.
NEW 2600 HF	Nontidal River	16,500,000	25,855,500		X						X		X	
NEW 2600 MF	Nontidal River	5,070,000	7,944,690		X						X		X	
NEW 2900 HF	Nontidal River	49,680,000	77,848,560		X								X	
NEW 2900 MF	Nontidal River	7,200,000	11,282,400		X								X	
NEW 2000 HF	Nontidal River	19,258,333	30,177,808	X							X		X	
NEW 2000 MF	Nontidal River	2,648,000	4,149,416	X							X		X	
NEW 2400 HF	Nontidal River	4,000,000	4,000,000	X									X	
NEW 2400 MF	Nontidal River	1,700,000	1,700,000	X									X	
NEW 3200	[redacted]													

HF - High Flow
MF - Median Flow
[redacted] Contains Confidential Business Information
0= Not applicable for this facility under these compliance scenarios

Table 5. Case Study Manufacturer Characteristics and Needed Compliance Actions and Costs

Primary SIC code	Profile of Facility's Cooling Water System							Current Compliance Assumptions	Projected Compliance Actions	Flow in gpm	Flow needed for Recirculating Cooling Tower gpm	Flow Needed for Activities Other Than Cooling Tower gpm
	Once Through	Once thru w/ ponds	Once thru w/ towers	Recirc.	Recirc w/ ponds	Recirc w/ towers	Other					
NEW 2600 HF	X					X		Trend for recirc; Since shoreline intake assume in littoral zone; assume meets flow criteria	Extend pipe 50 meters out of littoral zone; fan the opening to decrease the velocity to meet criteria	11,500	1,600	2,700
NEW 2600 MF	X					X		Trend for recirc; Since shoreline intake assume in littoral zone; after switching to 100% recirc, under 2 MGD no further action required.	Install cooling tower to make 100% recirc.	3,500	500	800
NEW 2900 HF	X					X		Trend for recirc; Since shoreline intake assume in littoral zone; assume meets the flow criteria	Extend the pipe outside littoral zone; fanning to meet velocity criteria with velocity caps for additional fish protection.	34,500	4,700	8,100
NEW 2900 MF	X					X		Trend for recirc; Since shoreline intake assume in littoral zone; after switching to 100% recirc, under 2 MGD no further action required.	Install cooling tower to make 100% recirc.	5,000	700	1,200
NEW 2000 HF	X					X		Trend for recirc.; assume meets flow and velocity (passive screens) criteria; assume in littoral zone	Dredge canal below littoral zone; install cooling towers	13,400	1,800	3,100
NEW 2000 MF	X					X		Trend for recirc.; assume meets flow and velocity (passive screens) criteria; assume in littoral zone; after switching to 100% recirc., flow is less than 2 MGD no further action required	Install cooling towers	1,800	200	400
NEW 2400 HF	X							After switching to 100% recirc., flow is less than 2 MGD no further action required	Install cooling tower to make 100% recirc.	2,800	420	-
NEW 2400 MF	X							Meets the 2 MGD exemption, no action required	None	1,200	180	-
NEW 3200								Assume in littoral zone, meets the flow criteria, and does not alter the natural stratification of the lake	Install cooling tower for 100% recirc.; extend the pipe to get out of littoral zone but within 50 meters; fan intake pipe to meet velocity criteria with velocity caps for additional fish protection; and add passive screens to reduce impingement			

Table 5. Case Study Manufacturer Characteristics and Needed Compliance Actions and Costs

	Capital Costs									Annual O&M Costs			Total Costs	
Primary SIC code	Velocity Reduction by Intake Fanning or Widening Cost $	Fish Handling Equipment Cost $	Passive Screen 0.5 ft/Sec $	Restoration Cost $	Pipe Extension Cost $	Velocity Cap Cost $	Canal Dredging Cost $	Cooling Tower Cost $	Total Techn. Capital Cost $	O&M Cost for cooling towers $	O&M Cost for Restoration $	Annual O&M Costs for Fish Handling $	Total Estimated Annual Cost $	Total Estimated Capital Costs $
NEW 2600 HF	$3,500	$0	$0	$0	$120,000	$0	$0	$0	$124,000	$0	$0	$0	$0	$124,000
NEW 2600 MF	$0	$0	$0	$0	$0	$0	$0	$246,000	$246,000	$70,000	$0	$0	$70,000	$246,000
NEW 2900 HF	$6,000	$0	$0	$0	$190,000	$21,000	$0	$0	$217,000	$0	$0	$0	$0	$217,000
NEW 2900 MF	$0	$0	$0	$0	$0	$0	$0	$341,000	$341,000	$90,000	$0	$0	$90,000	$341,000
NEW 2000 HF	$0	$0	$0	$0	$0	$0	$210,000	$866,000	$1,076,000	$220,000	$0	$0	$220,000	$1,076,000
NEW 2000 MF	$0	$0	$0	$0	$0	$0	$0	$139,000	$139,000	$50,000	$0	$0	$50,000	$139,000
NEW 2400 HF	$0	$0	$0	$0	$0	$0	$0	$202,000	$202,000	$60,000	$0	$0	$60,000	$202,000
NEW 2400 MF	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
NEW 3200													$1,110,000	$4,970,000

Table 6. Worst Case Costing Scenario for Steam Electric Plant

				Configuration of Facility's CWIS					Technology Types Being Used			
Base Plant	Water Body	FLOW GPD	Electricity Generation MW	Canal	Submerged Shoreline	Surface Shoreline	Bay-cove	Submerged Offshore	Fish Diversion	Passive Intakes	Fish Returns	Intake Screens
Coal-fired- Max flow for recirc	Estuary	1,247,000,000	2,558			X						X
Coal-fired - Avg flow for Top 1/3 of once through systems	Estuary	1,080,000,000	1,200			X						X
Nuclear - Max flow for recirc	Estuary	2,611,000,000	2,708			X						X
Nuclear - Avg flow for Top 1/3 of once through systems	Estuary	2,931,000,000	2,666			X						X

Table 6. Worst Case Costing Scenario for Steam Electric Plant

Base Plant	Profile of Facility's Cooling Water System						Current Compliance Assumptions	Projected Compliance Action(s)	Flow needed for Recirculating Cooling Tower gpm	Flow Needed for Activities Other Than Cooling Tower gpm
	Once Through	Once thru w/ ponds	Once thru w/ towers	Recirc.	Recirc w/ ponds	Recirc w/ towers				
Coal-fired- Max flow for recirc				X			Meets the recirculating criteria	Dredge canal to off the shoreline to get off the highly productive shoreline to a less productive area, and fan intake to decrease velocity; install traveling screens and fish handling to maximize survival of I&E fish	865,972	865,972
Coal-fired - Avg flow for Top 1/3 of once through systems	X						Assume meet none of the criteria for estuarine environment	Install cooling towers to meet 100% recirc.; Dredge canal to off the shoreline to get off the highly productive shoreline to a less productive area and fan intake to decrease velocity; install traveling screens and fish handling to maximize survival of I&E fish	75,000	75,000
Nuclear - Max flow for recirc	X			X			Meets the recirculating criteria	Dredge canal to off the shoreline to get off the highly productive shoreline to a less productive area and fan intake to decrease velocity; install traveling screens and fish handling to maximize survival of I&E fish	1,813,194	1,813,194
Nuclear - Avg flow for Top 1/3 of once through systems	X						Assume meet none of the criteria for estuarine environment	Install cooling towers to meet 100% recirc.; Dredge canal to off the shoreline to get off the highly productive shoreline to a less productive area and fan intake to decrease velocity; install traveling screens and fish handling to maximize survival of I&E fish	203,542	203,542

Table 6. Worst Case Costing Scenario for Steam Electric Plant

	Capital Costs						Annual O&M Costs			Total Cost	
Base Plant	Velocity reduction by Intake Fanning or Widening Cost $	Traveling Screen w/ fish handling equipment (0.5 fps) Cost $	Restoration Cost $	Canal Dredging Cost $	Cooling Tower Cost $	Total Techn. Capital Cost $	O&M Cost for cooling towers $	O&M Cost for Restoration $	Annual O&M Costs for Traveling Screens & Fish Handling $	Total Estimated Annual Cost $	Total Estimated Capital Costs $
Coal-fired- Max flow for recirc	$491,000	$8,600,000	$0	$4,200,000	$0	$13,291,000	$0	$0	$400,000	$400,000	$13,291,000
Coal-fired - Avg flow for Top 1/3 of once through systems	$41,000	$970,000	$0	$460,000	$22,000,000	$23,471,000	$5,220,000	$0	$55,000	$5,275,000	$23,471,000
Nuclear - Max flow for recirc	$1,112,000	$18,000,000	$0	$8,700,000	$0	$27,812,000	$0	$0	$900,000	$900,000	$27,812,000
Nuclear - Avg flow for Top 1/3 of once through systems	$110,000	$2,000,000	$0	$1,040,000	$54,300,000	$57,450,000	$15,590,000	$0	$100,000	$15,690,000	$57,450,000

Table 7. Projected New 800 MW Coal-Fired Facilities Compliance Actions and Costs

Base Plant	Water Body	FLOW GPD	Electricity Generation MW	Configuration of Facility's CWIS				
				Canal	Submerged Shoreline	Surface Shoreline	Bay-cove	Submerged Offshore
Coal1	Estuary	700,000,000	800					X
Coal2	Estuary	17,000,000	800					X
Coal3	Estuary	17,000,000	800					X
Coal4	Estuary	17,000,000	800					X
Coal5	Nontidal River	700,000,000	800					X
Coal6	Estuary	17,000,000	800					X
Coal7	Estuary	17,000,000	800					X
Coal8	Estuary	17,000,000	800					X
Coal9	Estuary	700,000,000	800					X
Coal10	Estuary	17,000,000	800					X
Coal11	Estuary	17,000,000	800					X
Coal12	Estuary	17,000,000	800					X
Coal13	Estuary	700,000,000	800					X
Coal14	Estuary	17,000,000	800					X
Coal15	Estuary	17,000,000	800					X
Coal16	Estuary	17,000,000	800					X

Table 7. Projected New 800 MW Coal-Fired Facilities Compliance Actions and Costs

	Technology Types Being Used				Profile of Facility's Cooling Water System					
Base Plant	Fish Diversion	Passive Intakes	Fish Returns	Intake Screens	Once Through	Once thru w/ ponds	Once thru w/ towers	Recirc.	Recirc w/ ponds	Recirc w/ towers
Coal1		X			X					
Coal2				X						X
Coal3				X						X
Coal4				X						X
Coal5				X	X					
Coal6				X						X
Coal7				X						X
Coal8				X						X
Coal9		X			X					
Coal10				X						X
Coal11				X						X
Coal12				X						X
Coal13		X			X					
Coal14				X						X
Coal15				X						X
Coal16				X						X

Table 7. Projected New 800 MW Coal-Fired Facilities Compliance Actions and Costs

Base Plant	Current Compliance Assumptions	Projected Compliance Action(s)	Flow in gpm	Flow needed for Recirculating Cooling Tower gpm	Flow Needed for Activities Other Than Cooling Tower gpm
Coal1	Assume meet none of the criteria for estuarine environment	Add cooling towers for 100% recirc, widen intake for velocity reduction, add traveling screens with fish handling equipment to reduce impingement and entrainment	486,111	48,611	48,611
Coal2	Trend for submerged offshore CWIS with screens. Meets the recirculating and velocity criteria.	Add fish handling technologies to reduce impingement and entrainment	11,805	11,805	11,805
Coal3	Trend for submerged offshore CWIS with screens. Meets the recirculating and velocity criteria.	Add fish handling technologies to reduce impingement and entrainment	11,805	11,805	11,805
Coal4	Trend for submerged offshore CWIS with screens. Meets the recirculating and velocity criteria.	Add fish handling technologies to reduce impingement and entrainment	11,805	11,805	11,805
Coal5	Assume within 50 meters of littoral zone, does not meet the velocity standard	Widen the intake to reduce velocity, extend the pipe to 50 meters outside the littoral zone	486,111	486,111	486,111
Coal6	Trend for submerged offshore CWIS with screens. Meets the recirculating and velocity	Add fish handling technologies to reduce impingement and entrainment	11,805	11,805	11,805
Coal7	Trend for submerged offshore CWIS with screens. Meets the recirculating and velocity criteria.	Add fish handling technologies to reduce impingement and entrainment	11,805	11,805	11,805
Coal8	Trend for submerged offshore CWIS with screens. Meets the recirculating and velocity criteria.	Add fish handling technologies to reduce impingement and entrainment	11,805	11,805	11,805
Coal9	Assume meet none of the criteria for estuarine environment	Add cooling towers for 100% recirc, widen intake for velocity reduction, add traveling screens with fish handling equipment to reduce impingement and entrainment	486,111	48,611	48,611
Coal10	Trend for submerged offshore CWIS with screens. Meets the recirculating and velocity criteria.	Add fish handling technologies to reduce impingement and entrainment	11,805	11,805	11,805
Coal11	Trend for submerged offshore CWIS with screens. Meets the recirculating and velocity criteria.	Add fish handling technologies to reduce impingement and entrainment	11,805	11,805	11,805
Coal12	Trend for submerged offshore CWIS with screens. Meets the recirculating and velocity criteria.	Add fish handling technologies to reduce impingement and entrainment	11,805	11,805	11,805
Coal13	Assume meet none of the criteria for estuarine environment	Add cooling towers for 100% recirc, widen intake for velocity reduction, add traveling screens with fish handling equipment to reduce impingement and entrainment	486,111	48,611	48,611
Coal14	Trend for submerged offshore CWIS with screens. Meets the recirculating and velocity criteria.	Add fish handling technologies to reduce impingement and entrainment	11,805	11,805	11,805
Coal15	Trend for submerged offshore CWIS with screens. Meets the recirculating and velocity criteria.	Add fish handling technologies to reduce impingement and entrainment	11,805	11,805	11,805
Coal16	Trend for submerged offshore CWIS with screens. Meets the recirculating and velocity criteria.	Add fish handling technologies to reduce impingement and entrainment	11,805	11,805	11,805

Table 7. Projected New 800 MW Coal-Fired Facilities Compliance Actions and Costs

	Capital Costs							
Base Plant	Velocity reduction by Intake Fanning or Widening Cost $	Traveling Screen w/ fish handling equipment (0.5 fps) Cost $	Fish Handling Equipment Cost $	Restoration Cost $	Pipe Extension Cost $	Canal Dredging Cost $	Cooling Tower Cost $	Total Techn. Capital Cost $
Coal1	$27,000	$700,000	$0	$0	$0	$0	$14,500,000	$15,227,000
Coal2	$0	$0	$33,000	$0	$0	$0	$0	$33,000
Coal3	$0	$0	$33,000	$0	$0	$0	$0	$33,000
Coal4	$0	$0	$33,000	$0	$0	$0	$0	$33,000
Coal5	$267,000	$0	$0	$0	$5,097,200	$0	$0	$5,364,200
Coal6	$0	$0	$33,000	$0	$0	$0	$0	$33,000
Coal7	$0	$0	$33,000	$0	$0	$0	$0	$33,000
Coal8	$0	$0	$33,000	$0	$0	$0	$0	$33,000
Coal9	$27,000	$700,000	$0	$0	$0	$0	$14,500,000	$15,227,000
Coal10	$0	$0	$33,000	$0	$0	$0	$0	$33,000
Coal11	$0	$0	$33,000	$0	$0	$0	$0	$33,000
Coal12	$0	$0	$33,000	$0	$0	$0	$0	$33,000
Coal13	$27,000	$700,000	$0	$0	$0	$0	$14,500,000	$15,227,000
Coal14	$0	$0	$33,000	$0	$0	$0	$0	$33,000
Coal15	$0	$0	$33,000	$0	$0	$0	$0	$33,000
Coal16	$0	$0	$33,000	$0	$0	$0	$0	$33,000

Table 7. Projected New 800 MW Coal-Fired Facilities Compliance Actions and Costs

	Annual O&M Costs				Total Cost	
Base Plant	O&M Cost for cooling towers $	O&M Cost for Restoration $	Annual O&M Costs for Fish Handling $	Annual O&M Costs for Traveling Screens & Fish Handling $	Total Estimated Annual Cost $	Total Estimated Capital Costs $
Coal1	$3,340,000	$0	$0	$38,000	$3,378,000	$15,227,000
Coal2	N/A	$0	$5,700	$0	$5,700	$33,000
Coal3	N/A	$0	$5,700	$0	$5,700	$33,000
Coal4	N/A	$0	$5,700	$0	$5,700	$33,000
Coal5	$0	$0	$0	$0	$0	$5,364,200
Coal6	N/A	$0	$5,700	$0	$5,700	$33,000
Coal7	N/A	$0	$5,700	$0	$5,700	$33,000
Coal8	N/A	$0	$5,700	$0	$5,700	$33,000
Coal9	$3,340,000	$0	$0	$38,000	$3,378,000	$15,227,000
Coal10	N/A	$0	$5,700	$0	$5,700	$33,000
Coal11	N/A	$0	$5,700	$0	$5,700	$33,000
Coal12	N/A	$0	$5,700	$0	$5,700	$33,000
Coal13	$3,340,000	$0	$0	$38,000	$3,378,000	$15,227,000
Coal14	N/A	$0	$5,700	$0	$5,700	$33,000
Coal15	N/A	$0	$5,700	$0	$5,700	$33,000
Coal16	N/A	$0	$5,700	$0	$5,700	$33,000

Table 8. New 800 MW Coal-fired Plants Compliance Actions and Costs for Uniform Standard

Base Plant	Water Body	FLOW GPD	Electricity Generation MW	Configuration of Facility's CWIS				
				Canal	Submerged Shoreline	Surface Shoreline	Bay-cove	Submerged Offshore
Coal1	Estuary	700,000,000	800					X
Coal2	Estuary	17,000,000	800					X
Coal3	Estuary	17,000,000	800					X
Coal4	Estuary	17,000,000	800					X
Coal5	Estuary	700,000,000	800					X
Coal6	Estuary	17,000,000	800					X
Coal7	Estuary	17,000,000	800					X
Coal8	Estuary	17,000,000	800					X
Coal9	Estuary	700,000,000	800					X
Coal10	Estuary	17,000,000	800					X
Coal11	Estuary	17,000,000	800					X
Coal12	Estuary	17,000,000	800					X
Coal13	Estuary	700,000,000	800					X
Coal14	Estuary	17,000,000	800					X
Coal15	Estuary	17,000,000	800					X
Coal16	Estuary	17,000,000	800					X

Table 8. New 800 MW Coal-fired Plants Compliance Actions and Costs for Uniform Standard

	Technology Types Being Used				Profile of Facility's Cooling Water System					
Base Plant	Fish Diversion	Passive Intakes	Fish Returns	Intake Screens	Once Through	Once thru w/ ponds	Once thru w/ towers	Recirc.	Recirc w/ ponds	Recirc w/ towers
Coal1		X			X					
Coal2				X						X
Coal3				X						X
Coal4				X						X
Coal5		X			X					
Coal6				X						X
Coal7				X						X
Coal8				X						X
Coal9		X			X					
Coal10				X						X
Coal11				X						X
Coal12				X						X
Coal13		X			X					
Coal14				X						X
Coal15				X						X
Coal16				X						X

Table 8. New 800 MW Coal-fired Plants Compliance Actions and Costs for Uniform Standard

Base Plant	Current Compliance Assumptions	Projected Compliance Action(s)	Flow in gpm	Flow needed for Recirculating Cooling Tower gpm	Flow Needed for Activities Other Than Cooling Tower gpm
Coal1	Assume meet none of the criteria for estuarine environment	Add cooling towers for 100% recirc, widen intake for velocity reduction, add traveling screens with fish handling equipment to reduce impingement and entrainment	486,111	48,611	48,611
Coal2	Trend for submerged offshore CWIS with screens. Meets the recirculating and velocity criteria.	Add fish handling technologies to reduce impingement and entrainment	11,805	11,805	11,805
Coal3	Trend for submerged offshore CWIS with screens. Meets the recirculating and velocity criteria.	Add fish handling technologies to reduce impingement and entrainment	11,805	11,805	11,805
Coal4	Trend for submerged offshore CWIS with screens. Meets the recirculating and velocity criteria.	Add fish handling technologies to reduce impingement and entrainment	11,805	11,805	11,805
Coal5	Assume meet none of the criteria for estuarine environment	Add cooling towers for 100% recirc, widen intake for velocity reduction, add traveling screens with fish handling equipment to reduce impingement and entrainment	486,111	48,611	48,611
Coal6	Trend for submerged offshore CWIS with screens. Meets the recirculating and velocity criteria.	Add fish handling technologies to reduce impingement and entrainment	11,805	11,805	11,805
Coal7	Trend for submerged offshore CWIS with screens. Meets the recirculating and velocity criteria.	Add fish handling technologies to reduce impingement and entrainment	11,805	11,805	11,805
Coal8	Trend for submerged offshore CWIS with screens. Meets the recirculating and velocity criteria.	Add fish handling technologies to reduce impingement and entrainment	11,805	11,805	11,805
Coal9	Assume meet none of the criteria for estuarine environment	Add cooling towers for 100% recirc, widen intake for velocity reduction, add traveling screens with fish handling equipment to reduce impingement and entrainment	486,111	48,611	48,611
Coal10	Trend for submerged offshore CWIS with screens. Meets the recirculating and velocity criteria.	Add fish handling technologies to reduce impingement and entrainment	11,805	11,805	11,805
Coal11	Trend for submerged offshore CWIS with screens. Meets the recirculating and velocity criteria.	Add fish handling technologies to reduce impingement and entrainment	11,805	11,805	11,805
Coal12	Trend for submerged offshore CWIS with screens. Meets the recirculating and velocity criteria.	Add fish handling technologies to reduce impingement and entrainment	11,805	11,805	11,805
Coal13	Assume meet none of the criteria for estuarine environment	Add cooling towers for 100% recirc, widen intake for velocity reduction, add traveling screens with fish handling equipment to reduce impingement and entrainment	486,111	48,611	48,611
Coal14	Trend for submerged offshore CWIS with screens. Meets the recirculating and velocity criteria.	Add fish handling technologies to reduce impingement and entrainment	11,805	11,805	11,805
Coal15	Trend for submerged offshore CWIS with screens. Meets the recirculating and velocity criteria.	Add fish handling technologies to reduce impingement and entrainment	11,805	11,805	11,805
Coal16	Trend for submerged offshore CWIS with screens. Meets the recirculating and velocity criteria.	Add fish handling technologies to reduce impingement and entrainment	11,805	11,805	11,805

Table 8. New 800 MW Coal-fired Plants Compliance Actions and Costs for Uniform Standard

	Capital Costs							
Base Plant	Velocity reduction by Intake Fanning or Widening Cost $	Traveling Screen w/ fish handling equipment (0.5 fps) Cost $	Fish Handling Equipment Cost $	Restoration Cost $	Pipe Extension Cost $	Canal Dredging Cost $	Cooling Tower Cost $	Total Techn. Capital Cost $
Coal1	$27,000	$700,000	$0	$0	$0	$0	$14,500,000	$15,227,000
Coal2	$0	$0	$33,000	$0	$0	$0	$0	$33,000
Coal3	$0	$0	$33,000	$0	$0	$0	$0	$33,000
Coal4	$0	$0	$33,000	$0	$0	$0	$0	$33,000
Coal5	$27,000	$700,000	$0	$0	$0	$0	$14,500,000	$15,227,000
Coal6	$0	$0	$33,000	$0	$0	$0	$0	$33,000
Coal7	$0	$0	$33,000	$0	$0	$0	$0	$33,000
Coal8	$0	$0	$33,000	$0	$0	$0	$0	$33,000
Coal9	$27,000	$700,000	$0	$0	$0	$0	$14,500,000	$15,227,000
Coal10	$0	$0	$33,000	$0	$0	$0	$0	$33,000
Coal11	$0	$0	$33,000	$0	$0	$0	$0	$33,000
Coal12	$0	$0	$33,000	$0	$0	$0	$0	$33,000
Coal13	$27,000	$700,000	$0	$0	$0	$0	$14,500,000	$15,227,000
Coal14	$0	$0	$33,000	$0	$0	$0	$0	$33,000
Coal15	$0	$0	$33,000	$0	$0	$0	$0	$33,000
Coal16	$0	$0	$33,000	$0	$0	$0	$0	$33,000

Table 8. New 800 MW Coal-fired Plants Compliance Actions and Costs for Uniform Standard

	Annual O&M Costs				Total Cost	
Base Plant	O&M Cost for cooling towers $	O&M Cost for Restoration $	Annual O&M Costs for Fish Handling $	Annual O&M Costs for Traveling Screens & Fish Handling $	Total Estimated Annual Cost $	Total Estimated Capital Costs $
Coal1	$3,340,000	$0	$0	$38,000	$3,378,000	$15,227,000
Coal2	$0	$0	$5,700	$0	$5,700	$33,000
Coal3	$0	$0	$5,700	$0	$5,700	$33,000
Coal4	$0	$0	$5,700	$0	$5,700	$33,000
Coal5	$3,340,000	$0	$0	$38,000	$3,378,000	$15,227,000
Coal6	$0	$0	$5,700	$0	$5,700	$33,000
Coal7	$0	$0	$5,700	$0	$5,700	$33,000
Coal8	$0	$0	$5,700	$0	$5,700	$33,000
Coal9	$3,340,000	$0	$0	$38,000	$3,378,000	$15,227,000
Coal10	$0	$0	$5,700	$0	$5,700	$33,000
Coal11	$0	$0	$5,700	$0	$5,700	$33,000
Coal12	$0	$0	$5,700	$0	$5,700	$33,000
Coal13	$3,340,000	$0	$0	$38,000	$3,378,000	$15,227,000
Coal14	$0	$0	$5,700	$0	$5,700	$33,000
Coal15	$0	$0	$5,700	$0	$5,700	$33,000
Coal16	$0	$0	$5,700	$0	$5,700	$33,000

Table 9. New Combined Cycle Facilities Compliance Actions and Costs

				Configuration of Facility's CWIS						Technology Types Being Used				
New Gen	Water Body	Flow GPD	Total Water Requirement GPD	Canal	Submerged Shoreline	Surface Shoreline	Bay-cove	Submerged Offshore	Other	Fish Diversion	Passive Intakes	Fish Returns	Intake Screens	Other Tech.
CC1	Estuary	60,000,000	60,000,000					X					X	
CC2	Lake, Pond or Res.	9,000,000	60,000,000					X					X	
CC3	Lake, Pond or Res.	9,000,000	60,000,000					X					X	
CC4	Lake, Pond or Res.	9,000,000	60,000,000					X					X	
CC5	Estuary	60,000,000	60,000,000					X					X	
CC6	Lake, Pond or Res.	9,000,000	60,000,000					X					X	
CC7	Lake, Pond or Res.	9,000,000	60,000,000					X					X	
CC8	Lake, Pond or Res.	9,000,000	60,000,000					X					X	
CC9	Estuary	60,000,000	60,000,000					X					X	
CC10	Lake, Pond or Res.	9,000,000	60,000,000					X					X	
CC11	Lake, Pond or Res.	9,000,000	60,000,000					X					X	

Table 9. New Combined Cycle Facilities Compliance Actions and Costs

New Gen	Profile of Facility's Cooling Water System							Current Compliance Assumptions	Projected Compliance action(s)	Flow in gpm	Flow needed for Recirc Cooling Tower gpm	Flow Needed for activities Other Than Cooling Tower gpm
	Once Through	Once thru w/ ponds	Once thru w/ towers	Recirc.	Recirc w/ ponds	Recirc w/ towers	Other					
CC1	X							Meets flow requirement	Install cooling towers, and fish handling equipment.	41,666	41,666	6,250
CC2						X		Meets the flow, velocity, and recirc criteria;	Extend the pipe	6,000	-	-
CC3						X		Meets the flow, velocity, and recirc criteria;	Extend the pipe	6,000	-	-
CC4						X		Meets the flow, velocity, and recirc criteria;	Extend the pipe	6,000	-	-
CC5	X							Meets flow requirement	Install cooling towers, and fish handling equipment.	41,666	41,666	6,250
CC6						X		Meets the flow, velocity, and recirc criteria;	Extend the pipe	6,000	-	-
CC7						X		Meets the flow, velocity, and recirc criteria;	Extend the pipe	6,000	-	-
CC8						X		Meets the flow, velocity, and recirc criteria;	Extend the pipe	6,000	-	-
CC9	X							Meets flow requirement	Install cooling towers, and fish handling equipment.	41,666	41,666	6,250
CC10						X		Meets the flow, velocity, and recirc criteria;	Extend the pipe	6,000	-	-
CC11						X		Meets the flow, velocity, and recirc criteria;	Extend the pipe	6,000	-	-

Table 9. New Combined Cycle Facilities Compliance Actions and Costs

	Capital Costs									Annual O&M Costs			Total Cost	
New Gen	Velocity Reduction by Intake Fanning or Widening Cost $	Fish Handling Equipment Cost $	Passive Screen 0.5 ft/Sec $	Restoration Cost $	Pipe Extension Cost $	Velocity Cap Cost $	Canal Dredging Cost $	Cooling Tower Cost $	Total Techn. Capital Cost $	O&M Cost for cooling towers $	O&M Cost for Restoration $	Annual O&M Costs for Fish Handling $	Total Estimated Annual Cost $	Total Estimated Capital Costs $
CC1	$0	$73,000	$0	$0	$0	$0	$0	$2,867,000	$2,940,000	$693,000	$0	$4,400	$697,400	$3,637,400
CC2	$0	$0	$0	$0	$162,000	$0	$0	$0	$162,000	$0	$0	$0	$0	$162,000
CC3	$0	$0	$0	$0	$162,000	$0	$0	$0	$162,000	$0	$0	$0	$0	$162,000
CC4	$0	$0	$0	$0	$162,000	$0	$0	$0	$162,000	$0	$0	$0	$0	$162,000
CC5	$0	$73,000	$0	$0	$0	$0	$0	$2,867,000	$3,029,582	$693,000	$0	$4,400	$697,400	$3,726,982
CC6	$0	$0	$0	$0	$162,000	$0	$0	$0	$162,000	$0	$0	$0	$0	$162,000
CC7	$0	$0	$0	$0	$162,000	$0	$0	$0	$162,000	$0	$0	$0	$0	$162,000
CC8	$0	$0	$0	$0	$162,000	$0	$0	$0	$162,000	$0	$0	$0	$0	$162,000
CC9	$0	$73,000	$0	$0	$0	$0	$0	$2,867,000	$3,029,582	$693,000	$0	$4,400	$697,400	$3,726,982
CC10	$0	$0	$0	$0	$162,000	$0	$0	$0	$162,000	$0	$0	$0	$0	$162,000
CC11	$0	$0	$0	$0	$162,000	$0	$0	$0	$162,000	$0	$0	$0	$0	$162,000

Table 10. New Combined Cycle Plants Compliance Actions and Costs for the Uniform Standard

				Configuration of Facility's CWIS						Technology Types Being Used				
New Gen	Water Body	Flow GPD	Total Water Requirement GPD	Canal	Submerged Shoreline	Surface Shoreline	Bay-cove	Submerged Offshore	Other	Fish Diversion	Passive Intakes	Fish Returns	Intake Screens	Other Tech.
CC1	Estuary	60,000,000	60,000,000					X					X	
CC2	Estuary	9,000,000	60,000,000					X					X	
CC3	Estuary	9,000,000	60,000,000					X					X	
CC4	Estuary	9,000,000	60,000,000					X					X	
CC5	Estuary	60,000,000	60,000,000					X					X	
CC6	Estuary	9,000,000	60,000,000					X					X	
CC7	Estuary	9,000,000	60,000,000					X					X	
CC8	Estuary	9,000,000	60,000,000					X					X	
CC9	Estuary	60,000,000	60,000,000					X					X	
CC10	Estuary	9,000,000	60,000,000					X					X	
CC11	Estuary	9,000,000	60,000,000					X					X	

Table 10. New Combined Cycle Plants Compliance Actions and Costs for the Uniform Standard

New Gen	Profile of Facility's Cooling Water System							Current Compliance Assumptions	Projected Compliance action(s)	Flow in gpm	Flow needed for Recirc Cooling Tower gpm	Flow Needed for activities Other Than Cooling Tower gpm
	Once Through	Once thru w/ ponds	Once thru w/ towers	Recirc.	Recirc w/ ponds	Recirc w/ towers	Other					
CC1	X							Meets flow requirement	Install cooling towers, and fish handling equipment.	41,666	41,666	6,250
CC2						X		Meets the flow, velocity, and recirc criteria	Add fish handling technologies.	6,000	6,000	6,000
CC3						X		Meets the flow, velocity, and recirc criteria	Add fish handling technologies.	6,000	6,000	6,000
CC4						X		Meets the flow, velocity, and recirc criteria	Add fish handling technologies.	6,000	6,000	6,000
CC5	X							Meets flow requirement	Install cooling towers, and fish handling equipment.	41,666	41,666	6,250
CC6						X		Meets the flow, velocity, and recirc criteria	Add fish handling technologies.	6,000	6,000	6,000
CC7						X		Meets the flow, velocity, and recirc criteria	Add fish handling technologies.	6,000	6,000	6,000
CC8						X		Meets the flow, velocity, and recirc criteria	Add fish handling technologies.	6,000	6,000	6,000
CC9	X							Meets flow requirement	Install cooling towers, and fish handling equipment.	41,666	41,666	6,250
CC10						X		Meets the flow, velocity, and recirc criteria	Add fish handling technologies.	6,000	6,000	6,000
CC11						X		Meets the flow, velocity, and recirc criteria	Add fish handling technologies.	6,000	6,000	6,000

Table 10. New Combined Cycle Plants Compliance Actions and Costs for the Uniform Standard

	Capital Costs									Annual O&M Costs			Total Cost	
New Gen	Velocity Reduction by Intake Fanning or Widening Cost $	Fish Handling Equipment Cost $	Passive Screen 0.5 ft/Sec $	Restoration Cost $	Pipe Extension Cost $	Velocity Cap Cost $	Canal Dredging Cost $	Cooling Tower Cost $	Total Techn. Capital Cost $	O&M Cost for cooling towers $	O&M Cost for Restoration $	Annual O&M Costs for Fish Handling $	Total Estimated Annual Cost $	Total Estimated Capital Costs $
CC1	$0	$73,000	$0	$0	$0	$0	$0	$2,867,000	$3,029,582	$693,000	$0	$4,400	$697,400	$3,726,982
CC2	$0	$71,000	$0	$0	$0	$0	$0	$0	$71,000	$0	$0	$4,300	$4,300	$71,000
CC3	$0	$71,000	$0	$0	$0	$0	$0	$0	$71,000	$0	$0	$4,300	$4,300	$71,000
CC4	$0	$71,000	$0	$0	$0	$0	$0	$0	$71,000	$0	$0	$4,300	$4,300	$71,000
CC5	$0	$73,000	$0	$0	$0	$0	$0	$2,867,000	$3,029,582	$693,000	$0	$4,400	$697,400	$3,726,982
CC6	$0	$71,000	$0	$0	$0	$0	$0	$0	$71,000	$0	$0	$4,300	$4,300	$71,000
CC7	$0	$71,000	$0	$0	$0	$0	$0	$0	$71,000	$0	$0	$4,300	$4,300	$71,000
CC8	$0	$71,000	$0	$0	$0	$0	$0	$0	$71,000	$0	$0	$4,300	$4,300	$71,000
CC9	$0	$73,000	$0	$0	$0	$0	$0	$2,867,000	$3,029,582	$693,000	$0	$4,400	$697,400	$3,726,982
CC10	$0	$71,000	$0	$0	$0	$0	$0	$0	$71,000	$0	$0	$4,300	$4,300	$71,000
CC11	$0	$71,000	$0	$0	$0	$0	$0	$0	$71,000	$0	$0	$4,300	$4,300	$71,000

Table 11. Dry cooling Tower Costs for New Coal-fired and Combined Cycle Plants

Base Plant	FLOW GPD	Electricity Generation MW	Profile of Facility's Cooling Water: Once Through	Profile of Facility's Cooling Water: Recirc w/ towers	Projected Compliance Action(s)	Flow in gpm	Total Water Requirement gpm	Capital Costs: Dry Cooling Tower Cost $	Capital Costs: Total Techn. Capital Cost $	Annual O&M Costs: O&M Cost for Dry Cooling Towers $	Total Cost: Total Estimated Annual Cost $	Total Cost: Total Estimated Capital Costs $
Coal1	700,000,000	800	X		Add dry cooling towers	486,111	486,111	$64,337,000	$64,337,000	$22,370,000	$22,370,000	$64,337,000
Coal2	17,000,000	800		X	Add dry cooling towers	11,805	118,050	$24,377,000	$24,377,000	$7,624,000	$7,624,000	$24,377,000
Coal3	17,000,000	800		X	Add dry cooling towers	11,805	118,050	$24,377,000	$24,377,000	$7,624,000	$7,624,000	$24,377,000
Coal4	17,000,000	800		X	Add dry cooling towers	11,805	118,050	$24,377,000	$24,377,000	$7,624,000	$7,624,000	$24,377,000
Coal5	700,000,000	800	X		Add dry cooling towers	486,111	486,111	$64,337,000	$64,337,000	$22,370,000	$22,370,000	$64,337,000
Coal6	17,000,000	800		X	Add dry cooling towers	11,805	118,050	$24,377,000	$24,377,000	$7,624,000	$7,624,000	$24,377,000
Coal7	17,000,000	800		X	Add dry cooling towers	11,805	118,050	$24,377,000	$24,377,000	$7,624,000	$7,624,000	$24,377,000
Coal8	17,000,000	800		X	Add dry cooling towers	11,805	118,050	$24,377,000	$24,377,000	$7,624,000	$7,624,000	$24,377,000
Coal9	700,000,000	800	X		Add dry cooling towers	486,111	486,111	$64,337,000	$64,337,000	$22,370,000	$22,370,000	$64,337,000
Coal10	17,000,000	800		X	Add dry cooling towers	11,805	118,050	$24,377,000	$24,377,000	$7,624,000	$7,624,000	$24,377,000
Coal11	17,000,000	800		X	Add dry cooling towers	11,805	118,050	$24,377,000	$24,377,000	$7,624,000	$7,624,000	$24,377,000
Coal12	17,000,000	800		X	Add dry cooling towers	11,805	118,050	$24,377,000	$24,377,000	$7,624,000	$7,624,000	$24,377,000
Coal13	700,000,000	800	X		Add dry cooling towers	486,111	486,111	$64,337,000	$64,337,000	$22,370,000	$22,370,000	$64,337,000
Coal14	17,000,000	800		X	Add dry cooling towers	11,805	118,050	$24,377,000	$24,377,000	$7,624,000	$7,624,000	$24,377,000
Coal15	17,000,000	800		X	Add dry cooling towers	11,805	118,050	$24,377,000	$24,377,000	$7,624,000	$7,624,000	$24,377,000
Coal16	17,000,000	800		X	Add dry cooling towers	11,805	118,050	$24,377,000	$24,377,000	$7,624,000	$7,624,000	$24,377,000
CC1	60,000,000		X		Add dry cooling towers	41,666	41,666	$9,295,000	$9,295,000	$2,867,000	$2,867,000	$9,295,000
CC2	9,000,000			X	Add dry cooling towers	6,000	60,000	$13,128,000	$13,128,000	$4,062,000	$4,062,000	$13,128,000
CC3	9,000,000			X	Add dry cooling towers	6,000	60,000	$13,128,000	$13,128,000	$4,062,000	$4,062,000	$13,128,000
CC4	9,000,000			X	Add dry cooling towers	6,000	60,000	$13,128,000	$13,128,000	$4,062,000	$4,062,000	$13,128,000
CC5	60,000,000		X		Add dry cooling towers	41,666	41,666	$9,295,000	$9,295,000	$2,867,000	$2,867,000	$9,295,000
CC6	9,000,000			X	Add dry cooling towers	6,000	60,000	$13,128,000	$13,128,000	$4,062,000	$4,062,000	$13,128,000
CC7	9,000,000			X	Add dry cooling towers	6,000	60,000	$13,128,000	$13,128,000	$4,062,000	$4,062,000	$13,128,000
CC8	9,000,000			X	Add dry cooling towers	6,000	60,000	$13,128,000	$13,128,000	$4,062,000	$4,062,000	$13,128,000
CC9	60,000,000		X		Add dry cooling towers	41,666	41,666	$9,295,000	$9,295,000	$2,867,000	$2,867,000	$9,295,000
CC10	9,000,000			X	Add dry cooling towers	6,000	60,000	$13,128,000	$13,128,000	$4,062,000	$4,062,000	$13,128,000
CC11	9,000,000			X	Add dry cooling towers	6,000	60,000	$13,128,000	$13,128,000	$4,062,000	$4,062,000	$13,128,000